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THE STRUCTURE OF OCCUPATIONAL MOBILITY IN THE U. S. ECONOMY

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ABSTRACT

Knowledge of the extent and character of occupational mobility is basic to efficient and effective manpower planning and forecasting. This study is a highly detailed approach to such extent and character research questions. The fundamental purpose of this investigation is the identification of mobility-related groups of occupations through use of a neutral methodology. A cluster configuration of occupations, based on mobility patterns and linkages, enables a test of the worth of the recently proposed "Job Family" basis of occupational classification. Also, it provides information on the nature and kind of families of jobs -- thus, there is a typological dimension to this study.

A theoretical approach to labor market dynamics through occupational mobility is provided in Occupation System Theory -- a synthesis of Vocational Development and Labor Market Structure theories in conjunction with the Job Cluster concept. Two mobility models are employed: (a) the probability transition matrix (P) and, (b) the recruitment dependence matrix (R). A separate report, CAC Document No. 104, is a Supplementary Appendix containing Occupational Code Transformations, Probability Transition (P) Matrix, and Recruitment Dependence (R) Matrix.

Several important conclusions evolve from this study: aside from identification of interesting supply interrelationships between the diverse job categories and amplification of the dynamics of labor market operation, the fundamental conclusion is that the job family model is the relevant basis of occupational classification.

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One could hardly hope to associate with a more qualified scholar of Census occupational statistics than James G. Scoville: He has written several articles on the quality of Census statistics; he is recognized as a major critic of the current classification scheme; and, he has developed the theoretical basis of an alternative classification system based on job families and levels of content. Dr. Scoville provided a considerable amount of time to review of my working papers and problems of methodology. He offered several suggestions, criticisms, and observations which led me to further explore the underlying implications of my empirical methodology.

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enough to review my theoretical analysis of the distance metric as applied to occupational mobility models. His contributions to my research greatly facilitated completion of the project. His conscientiousness, professional insight, and enthusiasm for research was a considerable source of motivation.

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under the authority of title I of the Manpower Development and Training Act of 1962. Researchers undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment. Therefore, points of view or opinions stated in this document do not necessarily represent the official position or policy of the Department of Labor."

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CHAPTER I

INTRODUCTION

Economists have long recognized the importance of mobility of the factors of production between alternative employments. Mobility of resources, defined in terms of the technical feasibility of substitution between productive factors and willingness of resource suppliers to engage in a variety of options, is at the heart of the concept of economic efficiency. Mobility enhances the ability of a dynamic market economy to adjust to the everchanging composition of final demand.

People are the basic resource unit in any economy. In the economist's elementary division of the factors of production into the categories of (1) labor, (2) land, (3) capital, and (4) entreprenurial ability, people directly occupy two places, the first and the fourth. Also, people clear, cultivate and mine the second and invent, design, manufacture, operate and maintain the third. Like the other factors of production, people are not homgeneous. There is substantial variation between human agents in manual dexterity, in capacity for physical endurance, in ability to reason analytically, and in ability to organize and supervise activities. In a simple tribal state, the variety of forms in which the human agent is cast is of lesser import: The simple agrarian economy requires only minor division of labor. But, as the extent of the market widens and the technical character of employment expands, the economy utilizes and becomes increasingly dependent upon the heterogeneity possessed by its work force.

Although increased division of labor enhances the productive capacity of the economy, it is not without attendant costs. In general terms, the cost to the economy is some loss of changeability of human resources: Acute division of labor lessens the willingness and ability of people to pursue alternative types of work. Institutional constraints, such as trade unions and management practices, and imperfect information about alternative options further constrain operational efficiency of the labor market.

Economists disagree about the extent of labor market inflexibility although they agree about its existence, importance, and need for further review. The ability of the supply of human resources to adjust to the everchanging composition of occupational, industrial, and geographic demand for labor has been central to many of their modern day economic issues and problems. For example, the central issue in the "structural unemployment" versus "inadequate aggregate demand" debate was, in the main, the degree of occupational and geographic immobilities of labor. More recently, spiraling inflation has occasioned interest in the role of an elastic labor market: Fluid transfer of human resources to sectors of excess demand. Current national priority shifts, with the attendant shifts in the composition of labor demand, underscore the necessity of more systematic and detailed study of the labor market allocative process. Through study of labor mobility, the economist examines the allocative efficiency of the labor market mechanism.

Labor supply adjustments are of several types: Movement into and out of the labor force; between employment and unemployment; and, changes in employer, industry, occupation, and geographic location. Furthermore,

various combinations of the above types of mobility are possible. For example, an individual can change occupation, industry, geographic location, in one labor market transaction. A less complex shift is change of occupation and industry, simultaneously. Other possibilities can be easily imagined.

As labor supply adjustment mechanisms, the various types of shifts of labor outlined above vary in significance. For example, a change of employer, maintaining constant industry and occupation, is a less significant shift than a change of industry maintaining constant occupation. Furthermore, a change of industry maintaining the same type of work performed is a less significant shift than a change of occupation maintaining constant industry. There are two rationale for this argument. First, it is argued that the nature and content of a given job or type of work performed is more closely associated with occupation than with employer, industry or locality. Second, a change in occupation is much more likely to involve substantial restructuring of skills and responsibilities. Since similar types of work such as "freight and material handling" are performed in a variety of industries, on an *a priori* basis, one might expect the industrial distribution of employment to be more flexible than the occupational distribution. Workers would have, in general, greater ability to make industrial versus occupational shifts. Flexibility of the supply of labor is better defined by flexibility in type of work performed as opposed to type of final good produced.[1]

Types of Labor Mobility Investigations

Three basic types of investigations of labor mobility have been identified by Parnes (1954).[2] The first category is concerned with the

"extent and character" question. Examinations of the "determinants" of labor mobility form the second type of study. Examinations of the economic rationality and purposiveness of labor mobility form the third type. Extent and character of labor mobility investigations attempt to answer questions such as the following: What is the total amount of job shifting? What is its relative composition in terms of inter-firm, industrial, occupational, and geographic shifting? Is job shifting dominated by relatively simple changes such as inter-firm shifts maintaining constant industry and occupation or do the more complex types, such as simultaneous shift of employer, industry occupation dominate? Is there a pattern to job shifting within "families of industries and occupations or, is the movement that takes place merely random in character?

The second category is concerned with the correlates of mobility. These studies deal with (a) individual characteristics of mobile workers and (b) the influence of the environmental setting of work on mobility. Research questions of type (a) assess differences in volume and pattern of mobility between various demographic groups. Type (b) studies examine the effect of such institutional factors as pension plans, unionization, occupational licensing and general economic factors such as the level of business activity on mobility.

The third category of investigations, economic rationality and purposiveness of mobility, is largely concerned with the responsiveness of workers to economic differentials between jobs. Differentials in net-economic advantage between jobs signal varying contributions to social product. According to the tenets of traditional economic theory,

these differentials induce movement between job types which, in turn, operate to reduce the wage disparity that initiated the movement. The basic assumptions of the theoretical model are tested by studies of the third type.

These basic approaches to the study of labor mobility are not unrelated. For example, a study of the extent and character of mobility is dependent on the state of aggregate demand, relative openness of various categories of employment and the demographic composition of mobile workers. Thus, it is somewhat inseparable from the determinants of mobility class of studies. Investigations of the pattern of job shifting are also dependent upon the structure of rewards between various job types. Thus, studies of the first type are related to the economic rationality of worker movement. The contrast between the three types of approach are seen as "gray" rather than "black-white." Many investigations have employed elements of all three approaches. Differences between studies of labor mobility are mainly attributable to degree of emphasis placed on the various types of approach. Yet, it is felt that the three types of approach outlined by Parnes are useful constructs for the formatting of the research question.

Purpose of Investigation

The topic under investigation is the structure of occupational mobility in the U.S. economy. Structure means the extent and character of occupational mobility. Thus, reliance will be placed on the first category of approach to the study of labor mobility. Other types of labor supply adjustments such as industrial and geographic mobility will not be treated. The purpose of the investigation is to answer questions

such as these: Are there distinct patterns of occupational mobility? Do the patterns of mobility suggest the existence of "families" of jobs? What is the relative importance of occupational mobility as a source of supply? Is the pattern of mobility characterized as random or structured? Is there evidence of a hierarchical structure of manpower flow between occupations? Do the patterns of mobility suggest extremely flexible or narrowly structured sources of supply to the various occupational categories or, is there evidence of both types of patterns?

These questions suggest the following hypothesis which is central to this study of occupational mobility:

> The numerous categories of occupations naturally partition into distinct sets or substructures such that occupations within each substructure are interrelated by significant, systematic, and non-random patterns of worker movement.

This hypothesis states that relatively homogeneous groups of occupations can be formed on the sole basis of pattern similarity in occupational movements. For reasons to be noted later, this hypothesis will be referred to as the "job family" hypothesis.

This investigation will represent a substantial departure from the mainstream of past studies of occupational mobility. One of the principal differences between this study and past investigations of occupational mobility is the extent of disaggregation: Over three hundred (300) detailed occupational categories are employed. Secondly, this study differs from past investigations of occupational mobility in the largeness of sample size. The 1970 Census Public Use Samples of 1:100 Basic Records will serve as the data base.[3] Thirdly, this investigation employs

methodology specifically developed to analyze similarities in mobility patterns between occupations which will enable an ascertainment of the structure of "relatedness" between the occupational categories.

The probable fruits of such an endeavor are multiple. First, this type of research is basic to the construction of occupational supply models. Beyond the increased knowledge of the extent of occupational mobility and the degree of flexibility between job types, the precise character of that flexibility is made evident. Therefore, the implications of increased labor requirements in a particular occupation could be traced through the occupational mobility structure to appraise the direct, first-round, impact on the other occupations which feed the one under study. Indirect effects on the "feeder" occupations could then be assessed. Thus, such information is basic to the construction of labor supply models which would be useful in assessing the extent to which alternative occupational demand patterns can be satisfied by the current work force.

Second, analysis of the degree and pattern of flexibility of occupational supply should provide additional evidence of the form and character of "job families." A job family is defined as a cluster of occupations interlinked through the technical and administrative organization of production. Dunlop extends the definition to include "a stable group of job classifications or work assignments within a firm (wage determination unit) which are also linked together (a) by technology, (b) by the administrative organization of the productive process, including policies of transfer and promotion, or (c) by social custom that they have common wage-making characteristics.[4] Several

types of job clusters are, also, suggested by Livernash including "departmental function group," skill families, related types of work, and the "workcrew or closely knit work group."[5] Because of the interrelations between jobs within a family by promotion, transferability, and substitutability, analysis of the flow of manpower between job types is a tool for identification of such job clusters.

Third, evidence of relatedness between occupations through mobility is an important tool for construction of an occupational classification scheme. The current aggregation of occupations into twelve major groups is based, primarily, on socioeconomic criteria, a classification base which has been severely criticized in recent years.[6] In general, the critique is that such a basis is no longer relevant to labor market and manpower research questions. Instead, a classification scheme with "technological" overtones in which grouped occupations are interrelated by higher than average "cross elasticities of supply" and "elasticities of substitution" is desired.[7] The first elasticity relates to the "willingness and ability" of individuals to move between alternative employment types; the second, the "technical ease of substitution" of workers in one job category for those in another. Each of these elasticities should be reflected in actual patterns of occupational movements to the extent that they are important descriptives of the interrelationships between the job categories. Reversing the argument, the mobility based partition of occupations offers evidence of the two elasticities and, thus, this evidence is an important tool for construction of a classification system. Particularly, such analysis is important for assessing the differential role of socioeconomic status

versus economic and technical considerations (job families) as the intervening mechanisms in the structure of occupational mobility.

Fourth, analysis of the structure of occupational mobility is basic to an increased understanding of the structure of the labor market. Economists have long abandoned the notion of <u>the</u> labor market in which each worker competes with all other workers for jobs. As early as 1874, the concept of "non-competing groups" was specified by Cairnes.[8] Although his non-competing groups were the various socioeconomic classes of society, it is recognized today that within each of these classes further subdivisions can be found. "Painters do not compete with bricklayers, or typists with accountants, or doctors with lawyers; nor individuals in Portland, Maine, with those in Portland, Oregon (except perhaps in certain professions)."[9]

Many facets of structure in the labor market are natural. Investments by workers in development of the skills attendant with a particular occupational endeavor restricts the alternative job types among which such workers can apply their acquired skills and, thus, reap the benefits of their investment. Employers may prefer to promote from "within" the firm not only for reasons of morale, but, also, in order to more efficiently utilize its manpower as workers gain familiarity with the productive process and are able to assume increased responsibilities. Furthermore, worker preferences and employer hiring practices tend to create submarkets. The female clerical market and the several part-time, part-year job types particularly suited for youth employment are examples.

But, beyond these natural tendencies, many economists argue that the boundaries of submarkets are further "balkanized" by institutional

rules of unions, employer associations and government. Kerr identifies two broad systems which result from such practices: communal-ownership (craft systems) and private-property (industrial systems). In the first type, the union controls the supply of labor "within a carefully defined occupational and geographic area."[10] Well defined seniority provisions, job hierarchies and "bumping" procedures are characteristics of the second type. The effect of these institutional systems is to more precisely define the boundaries between the "external" and "internal" markets with "ports of entry" jobs serving as the bridge. In the craft union case, the port of entry is the union office and union membership. In the industrial case, low skilled production jobs, clerk positions in clerical and sales and managerial trainee positions serve as ports of entry. Patterns of movement follow "the formal channels set by the institutional rules."[11] It is Kerr's belief that inter-occupational movement is reduced in the craft system while inter-firm movement is reduced in the industrial system. Overall, Kerr believes that total movement is probably reduced.

Ascertainment of the structure of occupational mobility should cast light on the degree and form of balkanization of the labor market. If Kerr's thesis is correct, occupational mobility should be highly structured. Extreme structure would be evidenced by prevalence of large coefficients of interchange between related types of work. Craft-type occupations should have relatively high retention rates. Port-of-entry jobs would tend to be closely related to the hierarchy of jobs on the occupational ladder immediately above them and relatively unrelated to job types of less similarity in type of work performed.

In very broad terms the purpose of this research has been outlined as an investigation of the labor supply adjustment mechanism through occupational mobility. The stance of the investigation will be from a "character and extent" methodological framework. The test hypothesis posited the existence of distinct substructures of occupations interrelated by significant, systematic and non-random mobility patterns. Determination of the "relatedness" between the various occupational categories with respect to the occupational mobility patterns they exhibit and the alignment of those occupations displaying such interrelatedness was said to be basic to the ascertainment of the structure of occupational mobility. Through knowledge of this structure, manpower supply models can be constructed, evidence of the form and character of "job families" is given, and general conclusions on the elasticities of occupational labor supply and extent of "balkanization" of the labor market become possible.

Plan of Report

The plan of this report calls for further amplification of the "job family" hypothesis, a review of method and evidence from past investigations of the volume and pattern of labor mobility, a discussion of conceptual and methodological problems inherent in a project of this scope, and specification of the theoretical models to be utilized in the ascertainment of the structure of occupational mobility. Each of the topics outlined above will, in their respective order, serve as the central themes of the next four chapters. Empirical implementation of the theoretical models will then be discussed. This is followed by an

examination of the mobility coefficients. Then, cluster representations will be presented. In the final chapter, a synthesis of the empirical results in relation to the test hypothesis will be attempted.

FOOTNOTES

[1]Herbert S. Parnes, Research on Labor Mobility (New York: Social Science Research Council, 1954), Bulletin 65: 96.

[2]Ibid., pp. 6-10.

[3]U.S. Bureau of the Census, Public Use Samples of Basic Records from the 1970 Census: Description and Technical Documentation (Washington, D.C.: U.S. Government Printing Office, 1972).

[4]John T. Dunlop, "The Task of Contemporary Wage Theory," in New Concepts in Wage Determination, eds. George W. Taylor and Frank G. Pierson (New York: McGraw-Hill Book Co., Inc., 1957), p. 129.

[5]E. Robert Livernash, "The Internal Wage Structure," in New Concepts in Wage Determination, eds. George W. Taylor and Frank G. Pierson (New York: McGraw-Hill Book Co., Inc., 1957), p. 150.

[6]James G. Scoville, "The Development and Relevance of U.S. Occupational Data," Industrial and Labor Relations Review 19 (October 1965): 70-79.

[7]G. G. Cain, W. L. Hansen, and B. A. Weisbrod, "Classification of Occupations: Some Problems of Economic Interpretation," in American Statistical Association Proceedings of the Social Statistics Section, 1966 (Washington, D.C.: n.p., 1966), pp. 199-203.

[8]J. E. Cairnes, Political Economy (New York: Harper and Brothers, 1874).

[9]Clark Kerr, "The Balkanization of Labor Markets," in Labor Mobility and Economic Opportunity, ed. E. Wight Bakke (New York: John Wiley and Sons, Inc., 1954), p. 94.

[10]Ibid., p. 97.

[11]Ibid.

CHAPTER II

THE JOB FAMILY HYPOTHESIS

Introduction

The stated hypothesis of this investigation is, in brief, that the labor market is partitioned into subsets of occupations such that occupations within each subset have relatively similar mobility patterns. The exact definitional meaning of "similar mobility patterns" will remain undefined for the present since this is a topic to be considered in the chapter on methodology. Yet, if there is a tendency for movement between the two occupational categories and, if there is relative similarity in mobility to other job types, the two occupational categories would seem to have similar mobility patterns. Thus, it is seen that there are two dimensions to a substructure of occupations related by similar mobility patterns: movement between occupations in the substructure (mutual manpower interchange) and movement to job categories outside the substructure (common mobility distributions). Occupations displaying such interrelationships in mobility patterns might be said to form a "job family." The overriding purpose of this investigation is to delineate the structure of interrelationships between job types by the process of occupational mobility which otherwise lie hidden in an empirical data matrix.

With respect to the job family hypothesis, the guiding light of theory is especially dim. Little of an *a priori* nature exists for classification of occupations on the basis of similar mobility patterns. In an advanced industrial economy such as the United States, occupations

differ considerably in social status, aptitude requirements, type of work performed, and type of industry. A multitude of factors play a part in the structure of inter-occupational mobility. But, as yet, a general theory which isolates the important determinants of the structure of occupational mobility does not exist.

Lack of a general theory has hampered the development of a standard occupation classification scheme. For example, the social science disciplines of sociology, psychology and economics differ markedly in emphasis placed on the various dimensions of occupations in the construction of classification systems. Sociologists have emphasized the concept of social status, which, in itself, is complex with its numerous dimensions of prestige, remuneration, education levels and superiority-inferiority relationships. Psychologists have emphasized aptitude differences between occupations. They have had little success in terms of a classification scheme because of considerable overlap in factors of intelligence between job types.[1] The emphasis of economists, due in part to the research questions of wage structure and manpower and training requirements, has been centered on the type of work performed and type of industry in which the work is performed. There is, of course, broad agreement between these disciplines in terms of desired content of an occupation system. Indeed, until recently, economists have been content to employ the Census aggregate classification scheme in their studies of occupational mobility when, in fact, the conceptual basis for construction of that system is socioeconomic. The main point of agreement among academicians is that no single system of classification will serve all needs. Similarly, it is doubtful that any single

theoretical construct can have substantial predicative power of the structure of occupational mobility.

A synthetic approach which attempts to integrate various theoretical aspects of sociology, psychology and economics is necessary if the complexity of the underlying forces which governs the structure of occupational mobility is to be captured. The purpose of this chapter is to attempt such a synthesis. The major elements of this synthesis are "vocational development" theory, "labor market structure" theory, and "job cluster" concept. Vocational development theory will form the conceptual basis for the fundamental process of labor market adaptation which affects all individuals. This process is defined and constrained to a considerable extent by various facets of labor market structure. The job cluster concept, which emphasizes the effect of technology on labor market operation, is useful in guiding the analysis along the microdimensions of the type of work performed.

Each of these theoretical constructs will be discussed, in turn, below. An attempt to integrate the various aspects of these successive theories into a theory of occupation systems follows. The purpose of this theory is to identify the rationale for the expectation of structure to the interoccupation flows of manpower. The distinction of the three theoretical frameworks as disjoint concepts is somewhat artificial. There is considerable continuity between each of these theoretical frameworks. Because of these overlaps, the synthesis of these theories, in my belief, has considerable power. For expository purposes, however, these three theoretical frameworks will be considered as relatively distinct.

Vocational Development Theory (V.D.T.)

The concept of vocational development as a continuous process of labor market adaptation of the individual worker has evolved over a number of years. Initially, its growth was largely due to dissatisfaction with "occupational choice" theories. The general nature of occupational choice theories is that the choice of occupation is a relatively distinct event. That is, at some point in an individual's life the selection of occupation is made. Prominent among theories of occupational choice is the "trait and factor" theory (matching persons and jobs). Although the theory of occupational choice appears in various guises (trait psychology, individual differences, differential psychology, actuarial or factorial approach), the basic tenor of this approach is that individuals are endowed with differing patterns of aptitudes. As a consequence, the "fit" of any given individual to any given job is dependent upon the correlation of his traits with the requirements of the job.[2] Vocational development theory, however, places emphasis on "life stages" through which individuals pass. "Basically, the individual does not choose an occupation, but rather makes a series of occupational and occupationally-related choices at different life stages which, when taken cumulatively, result in vocational development rather than occupational choice, per se."[3] According to V.D.T., there are several occupational possibilities for potential success and satisfaction for any given individual.

The most widely accepted of vocational development theories is Super's theory.[4] There are several historical antecedents to Super's work, however. Among the more important are Buehler,[5] Miller and Form,[6] and Ginzberg, et al.[7] Buehler identified several psychological life stages through which individuals pass, each stage with approximate age

ranges: (1) Growth Stage (birth to 14 years); (2) Exploratory Stage (15 to 25 years); (3) Establishment Stage (26 to 45 years); (4) Maintenance Stage (46 to 65 years); and, (5) Decline Stage (66 years to death). It should be emphasized that these stages were not singularly related to vocational aspects of life. For example, the adolescent exploration stage consists of finding a mate, and one's place in the community as well as exploring occupational possibilities.

Miller and Form, expanding on previous work of Davidson and Anderson, developed a sociological classification of life stages which is work oriented. The major stages of this classification are: (1) Preparatory Work Period; (2) Initial Work Period; (3) Trial Work Period; (4) Stable Work Period; and, finally, (5) the Retirement Period. There is approximate correspondence in age ranges between the work stages of Miller and Form and the life stages of Buehler. The major difference seems to be the work orientation of Miller and Form versus the entire life style orientation of Buehler.

A major advancement at a time when the distinction between vocational development and occupational choice had yet to be made is found in the work of Ginzberg, et al. This work represented a first attempt at a longitudinal theory of vocational development. There are four major components to the Ginzberg approach. First, the long-term nature of the process of occupational choice is recognized. Second, with the advancement of time, the process is recognized to become increasingly irreversible. Third, the final position of settlement of the individual in an occupation type is viewed as a compromise between desired goals and realistic labor market alternatives. Fourth, the

process is viewed as occurring in a series of relatively distinct stages. These stages are identified as the (1) fantasy period of childhood, (2) the tentative period of early adolescence, and (3) the realistic stage of middle and late adolescence. In the tentative period, the individual begins to bring his assessment of his capabilities and interests in conformance with potential alternatives in the labor market. The realistic stage is a period in which the individual actually explores alternatives and narrows his range of choice. Ginzberg's theory, although in recognition that occupational choice is a continuous process, still has elements of occupational choice theory in that the process is seen as relatively determined during adolescence. Yet, in its recognition of vocational choice as a process, rather than an event, it represents an important turning point in the development of V.D.T.

Super employs the building blocks of Buehler, Miller and Form, and Ginzberg, et al. in forming a general theory of vocational development. The guiding force which ties these works together is Super's innovation of the "self-concept" notion: The individual's continual assessment of his interests and abilities. The development of an individual's self-concept is, of course, a dynamic process beginning in early life. Through the institutions of the home, community, schools and contact with the world of work, youths are constantly exploring and searching for their place in life. As the individual's self-concept becomes increasingly tied to reality, vocational thinking transcends the world of fantasy. It becomes intertwined with the individual's likes and dislikes as well as perceived capabilities. Super views the period of adolescence as one of immergence of a self-concept in which the youth

explores reality and makes modifications in his self-concept to better fit with realities of life. Initial contacts with the world of work, outside the home and school, are likely through part-time or vacation employment. Through such exploration, the individual learns of the discipline associated with employment, and, in all likelihood, finds it not entirely different with the discipline associated with his educational experience. Part-time employment also affords the opportunity for youths to test their self-concepts with closer approximation to reality.

The exploration stage of vocational development continues long after the individual's initial employment experience. The process of reality testing of the self-concept is, in general, manifest through a number of employment experiences for those increasingly committed to the labor force. Information on the availability of job types, for a large number of new entrants to the labor force, is generally sought through personal contacts. Since these sources of job information are from friends, family and neighbors, the greatest probability is that the new labor force initiate will enter the labor market at an occupational level consistent with that of his personal associations. Then, there is a tendency for occupational inheritance through this informal procedure of labor market information seeking.

These initial years of labor market experience have been characterized as "floundering."[8] Individuals pass through a successive series of job types, each of which has little logical relation to the last. But, as the individual gains more information and knowledge, which enables a centering of self-concept, the young worker becomes increasingly vocationally committed to an occupational level.

Increased orderliness of labor market behavior is indicative of the establishment stage. The search process continues; nevertheless, such job changes are increasingly relationatory in that current job status is a function of previous job held. In this trial substage, the individual is attempting to implement his self-concept. The initial years of the establishment stage are marked by increased maturity, competence, and general adaptation to the world of work. The worker eventually finds his place in work life and stabilizes in a particular occupation field.

The stabilization substage of the establishment stage is characterized by goal directed behavior. The individual has settled on a particular occupational field and thoughts turn to career advancement within that occupational field. At any occupational level, from the semi-skilled to the professional, there are likely to be changes that involve shifting from doing the work, the supervising it, to planning it.[9] Increasing tenure with a particular employer brings advances in pay, increased responsibilities, and privileges such as increased in vacation time and pension rights. Rising family responsibilities and emotional attachments to the firm, work group, and community also contribute to the stabilization process.

With increased stabilization of the worker in a particular vocational field, the maintenance stage is ushered in. The worker is firmly established in a career, although that career may be less than dignified. "The horizontally mobile semi-skilled worker has a 'place in the world,' even though it is a shifting place. Shifting at the semi-skilled level is its essential character."[10] In the maintenance stage,

there are few attempts to seek alternative employment opportunities. There is a relaxing on the part of the worker in which he accepts his place in life and attempts to retain it. The concept of maintenance does not imply satisfaction with one's place in the world of work, merely acceptance.

With the advancement of age, the individual's self-concept must, in many instances, change dramatically. The individual must accept "himself-as-he-is-becoming" instead of trying vainly to keep "himself-as-he-was."[11] Physical and mental capacities diminish. The worker may seek or be transferred to a less demanding type of work. If the older worker loses his job, he finds it difficult to obtain work in his former employment type. In such instances, he may seek work in service related jobs such as janitorial work and watchman. Shifting to self-employment in a small business enterprise is also an alternative. Finally, the process of vocational development ends in retirement.

Career patterns are the vehicle through which the process of vocational development operates. The concept of career patterns has been employed in sociology in reference to the sequence of occupationally related events which occurs in an individual's lifetime. Initial work in this area was undertaken by Davidson and Anderson and expanded upon by Miller and Form.[12] Although there are probably as many career patterns as there are workers, certain general tendencies have been surmised. Super summarizes Miller and Form's six-fold classification for males into the following four general types: (1) Stable career pattern; (2) Conventional career pattern; (3) Unstable career pattern; and, (4) Multiple Trial career pattern.[13] Individuals with professional

career goals generally possess stable career patterns. The transition is, usually, directly from formal educational training to career occupation. The conventional career pattern is characteristic of a large majority of males. Examples include managerial vocations and the skilled trades. The unstable career pattern is characterized by a sequence of trial-stable-trial vocations in which the worker fails to develop a lifetime occupation. Workers in semi-skilled job types are likely to have such patterns. The multiple trial career pattern is characterized by frequent changes of employment between a variety of occupation types. In general, such patterns are typical of low-skilled workers. Such workers would tend to be found in the numerous classifications of low-skilled occupations in the service and laborer job types.

In recognition of differences in life patterns and social roles between men and women, particularly with respect to homemaking requirements, Super identifies seven types of female career patterns.[14] They are as follows: (1) Stable Homemaking career pattern; (2) Conventional career pattern; (3) Stable Working career pattern; (4) Double-Track career pattern; (5) Interrupted career pattern; (6) Unstable career pattern; and, (7) Multiple Trial career pattern. Women who marry while in school or shortly afterwards and do not return to the work force characterize the first category. In the conventional career pattern, school is followed by relatively brief work experience in occupations such as clerical, teaching, and nursing, before marriage. Super views such occupations as a stop gap, although each such occupation may have been initially entered as a lifetime career, but with "subsequent change of aspirations."[15]

The stable working career pattern is consistent with the stable career pattern of men in that the career becomes the woman's life work. In double-track career pattern, the woman leads a dual work life of job and homemaking. Super notes that this pattern is typical of both the upper and the lower occupational levels. The interrupted career pattern is exemplified by a sequence of working, homemaking, and return to the labor force, particularly when the children reach school age. The time span of nonparticipation in the labor force is somewhat related to socio-economic status. In general, the lower the socioeconomic status, the lesser the time span of nonparticipation because of childbearing. In the unstable career pattern, the woman alternates homemaking and labor force participation in relatively frequent sequences of varying duration. Economic events such as husband's loss of job may play a considerable role in this form of career pattern. The multiple-trial career pattern for females is similar to that of males in its frequent changes in employment between relatively unrelated and low-skilled jobs.

The career patterns of females, it is seen, are typically more complex than those of males because of responsibilities of homemaking.

In his specification of a general theory of vocational development, Super has emphasized the dynamic and continuous aspects of the process. Vocational development is seen by Super as a process in conjunction with the general development of individual's self-concept. From the fantasy periods of childhood, the individual's self-concept is ever increasingly tied to reality as the individual proceeds through formal education, initial job experience, and the trial work period before finally stabilizing in a vocation. Super acknowledges that many aspects of

the vocational development process are by "trial-and-error." As the individual attempts to implement his self-concept, floundering or frequent movement between unrelated job types is likely to occur. The increasing relationship between self-concept and reality, with passage of time, is concomitant with increased orderliness of labor market behavior and stabilization on a vocational level.

Unfolding of the vocational development process is through the vehicle of career patterns. Career patterns for women are more complex since market and non-market work are so closely intertwined. Although some individuals possess very stable career patterns, for most, the process of adaptation to a satisfying line of work may take a number of years. Such searching activities enable the individual to more sharply focus his self-concept.

Super's theory has a direct labor supply orientation. Aspects of labor demand in relation to labor market structure are treated next.

Labor Market Structure Theory (L.M.S.T.)

There are several structural aspects to the labor market which are inconsistent with the general assumptions of competitive economic theory. All workers are not in open competition with each other for a given stock of job vacancies which may exist at any point in time. Many individuals who have jobs and are relatively satisfied with those jobs are essentially not in the market, for example. This is one of several examples of natural frictions which develop. Others include loyalty to the firm and, in many instances, to a geographic region which reduces propensities for movement.

Cairnes recognized further compartmentalization of the labor market[16]:

> No doubt the various ranks and classes fade into each other by imperceptible gradations, and individuals from all classes are constantly passing up or down; but while this is so, it is nevertheless true that the average workman, from whatever rank he be taken, finds his power of competition limited for practical purposes to a certain range of occupations, so that, however high the rates of remuneration in those which lie beyond may rise, he is excluded from sharing them. We are thus compelled to recognize the existence of non-competing industrial groups as a feature of our economy.

There is, then, essentially a number of smaller labor markets rather than a single labor market. The porousness of submarket barriers is, of course, variable. The female clerical worker market would be an example of a relatively structureless market with limited barriers to entry and relatively porous walls between subclasses of clerical employment. The very observation, however, that there exists a female clerical market is, in itself, an observation of one aspect of structure to the labor market; namely, a sex-typing of occupations. (Please excuse the pun.) Nevertheless, it seems reasonable to speak of the female clerical market as less structured than, say, the market for "printing trades" crafts.

Kerr outlines two broad types of labor markets: 1. the structureless and, 2. the structured.[17] In the first, there is limited attachment between the worker and his employer. All applicants are given an equal consideration for all vacancies. An example is the day labor market in metropolitan communities such as Chicago. According to Kerr, "structure enters the market when different treatment is accorded to the 'ins' and to the 'outs.'"[18]

The structured labor market has two major components: the internal market and the external market. The manufacturing plant and the craft group are examples of internal markets. Dunlop has expanded on the definition of the internal labor market as "the complex of rules which determines the movement of workers among job classifications within administrative units such as enterprises, companies, or hiring halls. These movements may be transfers, promotions, demotions, or layoffs to the exterior labor market. These movements may be temporary or permanent, which may affect the operation of the rules . . . ."[19]

A "web of institutional rules" governs the process of internalization of an individual worker. Initially, the worker finds himself a member of a vast, relatively undifferentiated labor pool in the external labor market. Through port-of-entry jobs, the worker is gradually initiated into the internal market. Apprenticeship training is an example of such a process of internalization. In general, the number of port-of-entry jobs into the internal labor market is inversely related to the degree of structure. Thus, craft vocations might be expected to have relatively few port-of-entry jobs while semi-skilled industrial type jobs would be expected to have several ports of entry.

Kerr notes that aspects of structure to the labor market generally do not arise out of institutional rules.[20] Rather, employer and employee preferences foster growth of many elements of structure. Kerr's opinion is, however, that such institutional practices uniformly add to natural elements of labor market structure. The imprecise boundaries of the labor market become formalized by institutional rule-making and, consequently, more precisely delimited. The degree to which the

"balkanization" is amplified, over and above the natural tendencies for structure, is a difficult question to examine empirically. It may be that institutional rules have simply formalized already existing structural aspects of the labor market. From an empirical standpoint, the extent of balkanization of the labor market is very much an unsettled question.

Aside from matters of equity and custom, as exemplified by promotion from within the firm as a reward for loyalty, several aspects of labor market structure have economic origins. Super develops the concept of "occupational life spans" which explains some aspects of economic structure.[21] Reder presents a model in which hiring standards vary inversely with the level of economic activity.[22] Oi demonstrates how hiring and training costs, when added to a perfectly competitive wage model, can produce differential shifts in demand for various grades of labor in response to a change in product price.[23] The models of Super, Reder, and Oi, underline the economic dimensions of labor market structure.

One noticeable feature of the world of work is occupation variation in "age of entry." Similarly, occupations differ considerably in retirement age. Thus, occupations possess a life span. Entry into an occupation is of three types: early, normal, late. Early entry occupations are those which require minimal formal education. Thus, entrants to such occupations tend to be relatively young and lacking in skills. Normal entry occupations tend to be entered upon completion of formal education and/or after a brief initial work experience. Normal entry occupations generally require some maturity on the part of the new

entrant. Typically, entrants to normal entry occupations will have had previous work experience in the form of "dead-end" youth type jobs, on-the-job training, or apprenticeship. Extended training and/or work experience requirements are characteristic features of late entry occupations. Professional occupations, managers, and the skilled crafts are examples.

In general, the age of exit is consistent with age of entry. That is, occupations which tend to be entered early in life are also left early in life. The numerous youth type occupations such as newsboy, ushers, messengers and attendants are examples of early-entry, early-exit occupations. Some early-entry jobs can, however, extend into lifetime vocations. The obvious example is domestic service. Common retirement age is typical of normal-leaving occupations. Late-leaving is characteristic of jobs with late retirement (self-employment) or jobs to which workers turn as their capacities for physical endurance diminish (janitors and watchmen).

Education, training, and maturity requirements of different jobs creates an age overlap between jobs. According to Super's thesis, then, there should be several differences in age distributions between job types. The examples provided by Super are intuitive, but not tested. The relative importance of the age structure of the occupational domain is not known. Super has hypothesized, in effect, that age of workers is an important dimension of occupations.

Labor market structure theory is a key component of Reder's theory of occupational wage differentials. Reder hypothesizes that variations in quality, manifest through changes in hiring standards, are

relatively more important than changes in wage rates as an allocator of manpower. "When applicants become scarce, employers tend to lower the minimum standards upon which they insist as a condition for hiring a worker to fill a particular job--and vice versa when applicants become plentiful."[24] Firms prefer to rely on quality variation rather than wage changes for a variety of reasons. One reason is the belief that if the wage structure of the firm is raised, competitors will follow suit; therefore, such actions could yield, at most, only a temporary advantage. By promotion from within the firm, management can in general acquire additional workers of a particular grade without any change in the structure of wages between grades of employment. The practice of upgrading workers during periods of demand expansion and downgrading during periods of contraction is a convenient means of "getting around" contractually agreed upon wage rates. Union officials are more likely to be receptive to such job transfers, which involve only a few workers, than to a general reduction of wages. Furthermore, upgrading of quality workers through training, particularly for those who are somewhat familiar with aspects of the productive process, can frequently be obtained with minor expense.

Thus, Reder envisions a continuous process of upgrading or downgrading a worker in response to variations in product demand. Hiring standards vary inversely in relation to the level of economic activity. In recessionary periods, workers are overqualified relative to the jobs they hold. In expansionary phases, workers progress up the skill ladder as "labor slack" diminishes. Enrollment in the "vestibule school" varies directly with the level of business activity.

At the base of the occupational ladder is the labor reserve. "It is well known that the business sector of most economies usually possesses a labor reserve in the form of unemployed work-seekers, low-income farm youths, oldsters, juveniles, housewives, etc., who will accept jobs in the business or government sectors of the economy at the going wage rates whenever such jobs are available."[25] The bulk of these workers in the labor reserve are capable of only unskilled work; such workers perform the important function of replacing unskilled workers who are attracted to better employment opportunities.

Disagreeing with aspects of Reder's theory, Oi prefers to treat labor as a quasi-fixed factor. Elements of "fixity" arise when hiring and training costs are added to the competitive wage model. Investments in the training of workers are designed to raise their productivity. The expected return on the investment in training of the worker by the firm is dependent upon the increment in productivity of the worker per time period and, importantly, the number of time periods that the firm expects to retain the individual worker. Training expense can be divided into the two categories of specific and general training. Specific training increases productivity to a particular firm while general training raises the workers' productivity among the several firms. Rational behavior dictates that training investments by the firm be specific in nature. To the extent that the firm invests in general training, the worker would be able to demand a higher wage with the threat of leaving his present employer. Whether he remains with his present employer at a higher wage or moves to alternative employment, the firm which supported the general training is unable to reap a return on its investment.

The amount of profitable investment and training of any given worker is dependent upon three factors: 1. the per period increment in marginal value product; 2. the number of time periods which the individual works for the firm; and, 3. the rate of return required by the firm and its human capital investment. In general, the greater are factors 1 and 2 and the lesser is factor 3, the greater the amount of training investment by the firm in the individual worker.

As a result of the fixed hiring and training costs, labor takes on the characteristics of a fixed factor. The degree of fixity is measured by the ratio of periodic rent, amortized initial fixed employment costs, to the total employment costs. When periodic rent is close to zero, as would be the case of unskilled labor, the factor is a completely variable input. The greater the periodic rent, as would be the case with skilled grades of labor, the greater is the quasi-fixed nature of the factor input. Thus, "the periodic rent drives a wedge between the wage rate and the marginal value product, the relative magnitude of the wedge being measured by the degree of fixity."[26] A major conclusion from Oi's theoretical work is that fluctuations in factor demand in the short-run are inversely related to the degree of fixity.

The argument is as follows: First, in a short-run equilibrium the total marginal value product is equal to total employment cost. Since the total employment cost is divided into wage cost and periodic rent, it follows that the marginal value product of labor is greater than the wage rate. Second, fixed employment costs are sunk costs and, thus, do not affect the firm's short-run employment decisions. Only the variable cost of labor, wages, is appropriate in a short-run. Third, a long-run

competitive equilibrium is assumed, initially. Thus, a decline in product demand reduces the price of output and, consequently, the marginal value product of labor. From these conditions and assumptions, it follows that employment of a quasi-fixed factor will not be reduced so long as the marginal value product of that labor input is greater than or equal to its wage. The greater the degree of fixity, the greater is the necessary decline in product price needed to economically justify dismissal of that factor input. "In fact, there is, for each quasi-fixed factor, a critical price at which the firm will reduce its demand for that factor."[27] The argument works in reverse. A rise in product price will in general increase the relative demand for factors with low degrees of fixity.

Through the induction of hiring and training costs into the perfectly competitive model, Oi demonstrates that the fixed cost elements of employment effectively form a "buffer" which absorbs short-term changes in factor demand. Labor input with low degrees of fixity are the first laid-off. Employment of unskilled workers must necessarily fall in order to raise the marginal productivity of that labor and thus bring marginal value product back into the quality with the wage rate. In Oi's model, as in Reder's, the relatively unskilled workers will be the "last hired and first fired."

Recent trends in labor market structure theory have placed greater emphasis on the lower rungs of the skill hierarchy. In this literature, the labor market is viewed as divided into primary worker and secondary worker segments; thus, the concept of dual labor markets. The secondary labor market is the "structureless" labor market described by Kerr in which there are few attachments between the worker and employer,

except for the wage. While the theories of Oi and Reder are concerned with the internal labor market and the structural relations between the internal labor market and the secondary labor market, dual labor market theory stresses the importance of the secondary labor as an entity, in and of itself, rather than merely as an adjunct to the internal labor market. The role of the employment queue, typified by Reder's analysis, is downplayed in the dual labor market theory.

Noticeably lacking in skills, secondary workers are relegated to employment in "peripheral" firms which typically operate in highly competitive product markets. Production is labor intensive and profit margins are narrow. Consequently, such firms place considerable emphasis on wage costs. The relatively small size of peripheral firms combined with the lack of skill requirements, leaves little room for advancement. The competitive nature of the industry, low capitalization, and lack of diversification in production, tends to make such firms particularly susceptible to variations in product demand. A small decline of demand can bring on financial ruin for the peripheral firm. These characteristics of peripheral firms are unlikely to prove attractive to primary workers.

Important contributors to the recent literature on dual labor market theory include Averitt,[28] Barron and Hymer,[29] Bluestone,[30] Doeringer and Piore,[31] Harrison,[32] Morse,[33] and Piore.[34]

In summary, labor market structure theory is concerned with identification of the forces which tend to compartmentalize the labor market into a system of submarkets. Also, this theory is concerned with the interrelationships between these submarkets through the process of labor mobility.

Aspects of the theoretical works of Kerr, Super, Reder, Oi, Averitt and others form the core of that theory. Kerr has stressed the importance of the institutional practices which tend to insulate the internal market, exemplified by the craft group or industrial plant, from market forces. But, more importantly, Kerr's concepts of internal and external labor markets and port-of-entry linkages have proved to be the mainstays of the growing body of literature on labor market structure theory. Super emphasizes differentials between job types in "age of entry" due to formal training requirements (registered nurse versus practical nurse), levels of maturity (stockboy versus corporation executive), and skill prerequisites (compositor versus warehouseman). Age is an important structural dimension of occupations in Super's framework. Reder's model, although primarily concerned with occupational wage differentials, is useful in understanding certain aspects of labor market structure: Hiring standards tend to demarcate labor markets, producing a queuing effect, and variations in those standards produce movement along the ladder of skill hierarchy.

Oi demonstrates through use of a human capital model why demand is relatively more stable for trained workers. An important conclusion from Oi's model is that the amount of investment by the firm in the human agent is a direct function of the expected employment period. Firms would be reluctant to invest in old workers, because of the shorter period to retirement, and youth, because of the inherit instability of this group.

Averitt and others hypothesize a bifurcation of the industrial structure into "core" and "peripheral" firms, each with respective

reliance on primary and secondary workers. The labor market is split, in their models, as opposed to queued, as in Reder's model. There probably exists a tendency for both effects--bifurcation and queuing. The relative extent of each would be functionally related to the state of aggregate demand. Queuing would be relatively more important in expansionary phases.

Labor market structure theory provides a general outline of labor market operation. For the specifics of that operation, further conceptual refinements are necessary. Such refinements are provided by the job cluster concept.

The Job Cluster Concept

The "production function," which is a schedule of physical output possibilities associated with given factor inputs, is a central theoretical tool of economic analysis, *par excellence*. It is the fundamental conceptual device upon which the theory of the firm is built. But, as stated, the production function concept is very much a simplification. A given establishment has not just one area of production, but several. The firm becomes "departmentalized" into separate areas of production as the extent of the market widens. Furthermore, through "division of labor," production in any given department is divided into a number of relatively distinct tasks, rather than a single process, which combine to form the department's production function. Adam Smith's celebrated example of division of labor in the manufacture of pins is illustrative of this point[35]:

> One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on, is a peculiar business, to whiten the pins is another; it is even a trade by itself to put them into the paper.

Through specialization and division of labor, a variety of job options arise within a given productive process. These related types of work are intertwined by the common production function. The notion of "commonalities in production" is central to the "job cluster" concept.

Dunlop provides a modern day example of a job cluster, the tool room of a manufacturing plant.[36]

> The training and skill of the machinists who operate the various specialized machines--lathes, shapers, cutters, and so on--are similar. Their work is closely interrelated in the productive process. They may work together apart from others. They may have common promotion, transfer and layoff pattern. The wage rates within the tool room are more closely related to each other than they are to the rates for other employees in the power plant--on production lines, in the maintenance crew, in the office or in the sales force.

In these few statements, Dunlop has identified the major factors which demarcate the boundaries of a job cluster: similarities in training and skill requirements, common production function, and geographic proximity within the work establishment. As a result of these affinities, workers within a job cluster are envisaged to have interrelated mobility patterns and correspondence in the internal wage structure of the firm. The "tool room" is an example of a job cluster which arises, primarily, out of technology. Administrative organization (Marketing Division) and social custom (service work) are also important factors which give rise to job clusters.

Although there is no single criterion for demaracation of job clusters, emphasis has been placed on the notion of "common production function" by Livernash.[37]

> Geographic location within a plant, organizational pattern and common supervision, related and common job skills, common hiring jobs and transfer and promotion sequences, as well as a common production function, tie jobs together. The notion of a common production function deserves some emphasis, however. Departments frequently signify separate job groupings as they relate to different phases of production, thus constituting a functional group of related jobs.

In his underlining of the importance of "commonalities in production" as the predominant factor in the determination of job clusters, Livernash is vaunting the role of technology.

Scoville identifies five major categories of job options which arise from the technology of production.[38] His first category is the "tools" class: "small, individually operated pieces of equipment which usually involve the attention of one worker."[39] The second broad form of technology is the "machines" class. There are singular and multiple stages of job options which characterize the machines class. In singular types, man/machine operation as exemplified by the occupation of "drill press operator," the job is narrowly defined. Multiple stage job options, however, arise from continuous production processes, such as a rolling-mill operation, which, at various stages, require worker attention. Spatial dispersion between raw material sources, manufacturing sites, product markets and even within firms gives rise to a third set of job options related to transport. A fourth classification is distinguished by lack of "formal and technological intervention between labor input and

resulting output."[40] Service work, with its labor-intensive flavor, is indicative of this form of technology. The final class of job options arise from the technology of human knowledge: "Knowledge broadly defined is an intermediary factor of production between input and output much like a piece of physical equipment.[41]

These central forms of technology are the headspring by which job clusters develop about a specific aspect of production or "situs," a concept first employed by Hatt.[42] Eight situs types are identified by Hatt: 1. political; 2. professional; 3. business; 4. recreation and aesthetics; 5. agriculture; 6. manual work; 7. military; and, 8. service. Each situs has specific subdivisions. For example, the manual work situs is divided by Hatt into five categories: A. skilled mechanics; B. construction trades; C. outdoor work; D. factory work; and, E unskilled labor. A number of detailed categories comprise each of these situs subdivisions. Scoville offers a reclassification of Census detailed occupational categories by job families employing criteria of promotion, transferability and substitutability and other technological considerations in demarcating boundaries.[43] In fact, recent work in the field of occupational classification has turned from socio-economic criteria as the basis for classification to a job cluster and situs conceptual framework with job families divided by "content" levels. In Chapter IV, aspects of this work will be discussed in the section entitled "Alternative Conceptual Frameworks."

Varying levels of job content (skills, abilities, and responsibilities) within an occupational family, in many instances, signifies a logical progression sequence, each step with an attendant hierarchy of

job requirements. An example of a promotion sequence can be found in the Business situs: clerical --> sales --> management. Scoville cites several examples in the Manual Work situs[44]:

> The first step below a job, in terms both of promotion and of content, is often one of "assistant" or "helper." Machinists' helpers generally provide materials, clean up the workplace, and perform lower-skilled jobs to expedite the work of the craftsman. Usually, the focus of a helper's job is the same as that of the man he helps, being involved with the same materials, equipment, and processes. Numerous cases could be cited ob job clusters about large industrial machines: for example, the melters' and helpers' jobs associated with an open hearth, ranging from the foreman to the cinder pitman. Similar is the hierarchy of jobs found in a rolling mill--with the roller at the top, next, his assistant, and then the jobs of finisher, speed operator, and rollhand, among others. A further example of a promotion ladder is found on the railroads, where new operating employees are generally hired as firemen or brakemen and are promoted to engineers and conductors. These groupings and ladders are exemplary of the job family on the micro-economic level of the operating unit.

Similar examples could be noted in the construction trades.

Promotion sequences are perceived, then, as not only external to the job cluster (promotion to supervisor or foreman), but as internal to the job cluster as well. Through establishment of a promotion sequence, the firm is, in effect, creating a manpower reserve linkage. Workers can be upgraded along this promotion ladder, as demand requires, with minimal investments in time and training on the part of the firm. As noted by Doeringer, "The process of designing jobs and of determining hiring and internal mobility patterns provides one of the primary mechanisms by which the costs of entry training and internal retraining are controlled within the plant."[45]

The breadth of a job cluster is an inverse function of the specificity of job types within. There are two rationale for this observation. First, specialized job types generally require extended periods of training which tends to lessen the "elasticity of substitution" and "cross elasticity of supply" between the specialized functions and job types outside the relevant cluster. Second, specialized job types are found in relatively distinct industries (railroad transport and printing industries) with production employment concentrated in a few job types which tends to limit transfer possibilities. Specialization, then, implies narrower ranges of movement.[46]

In summary, the job cluster concept affirms the role of technology as an independent variable in the proliferation of job options in the highly industrialized economy. These job options are interrelated by varying degrees of connectedness to specific modes of production or situses. As a result of commonalities in technical focus, workers in a given job cluster will tend to have correlative skills and abilities such that the "elasticity of substitution" is higher between workers within the cluster than between workers in separate clusters.[47] From the employer's point of view, workers within a job cluster are better substitutes between job types within the cluster. Elasticity of substitution between two job types can be approximated by the cost of additional retraining necessary for workers in one job class to acquire the skills of another or by productivity differentials. The higher the cost of retraining or the greater the productivity differential, the lower is the elasticity of substitution. Furthermore, job types within a cluster are related by relatively high "cross elasticities of supply."[48]

The necessary change in remuneration needed to induce a given amount of movement of workers from one job type to another is an inverse measure of supply cross elasticity. This concept is more closely associated with the worker's viewpoint. In consequence, "commonalities in production" will tend to produce "similarities in mobility patterns."

Synthesis--Occupation System Theory

Are there affinities to worker movements between related occupations, or are such movements primarily random? Are there differentials in volume of mobility between occupations? If so, why? What is the effect of the general operation and structure of the labor market on the structure of interoccupational movements? The purpose of this section is to integrate vocational development theory, labor market structure theory and the job cluster concept into a composite theory which professes particular insight into such questions of the extent and character of occupational mobility.

This theory will be referred to as "occupation system theory" in recognition of the work of Broom and Smith who first developed the idea of occupation classification on the basis of "potentiality for mobility or immobility inherent in particular forms of employment."[49] They identified six substructures of occupations: (1) bridging; (2) closing; (3) preparatory; (4) career hierarchies; (5) incremental hierarchies; and, (6) residual. Their work is interesting but incomplete since the general operation of the labor market and the important role of technology is given very limited attention, if any. Furthermore, their work is closely related to the British labor market which, as evidence suggests, is more formally organized than the U.S. labor

market.[50] An occupation system theory relevant to the U.S. economy must take into account the many "free form" elements of our labor market, particularly the accommodation process of the young.

Each of the three major bodies of theory interactively contributes to occupation system theory. Vocational development theory was previously acknowledged as supply related; labor market structure theory, primarily demand related. The job cluster concept emphasized the technological aspects of production: The variety of job types which develop from technology which are interrelated through commonalities in production. Vocational development theory and labor market structure theory combine to define the general functioning of the labor market; the job cluster concept, which contains elements of both of the aforementioned theories, defines the specifics of that operation.

Most markets are composed of several submarkets. For example, the automobile market is divided into categories of subcompact, compact, intermediate, and luxury. Similarly, the labor market is divided into subclasses. As noted previously, this feature of the labor market has been long recognized. Individuals are, of course, continually moving along the occupational ladded of hierarchy. Thus, the boundaries of the occupational subgroups are semi-permeable. Nevertheless, a given individual, as noted by Cairnes, finds his power of competition limited to a few job alternatives. Of course, over time the barriers to movement breakdown, particularly from one generation to the next. But, for the short-run, the ability of a given worker to transcend a submarket boundary is limited.

The process of vocational development and the structure of the labor market are important factors in the general demarcation of the labor market into submarkets. The process of vocational development operates from the supply side: The transition of individuals through the life stages of growth, exploration, establishment, maintenance and decline; development and reality testing of self-concept in the exploratory stage; implementation of self-concept in the trial and stable phases of the establishment stage; manifestation of the process of vocational development through a variety of career patterns. Labor market structure theory, on the other hand, stresses the institutional and economic factors which tend to partition the labor market, broadly into the two substructures of external (the "outs") and internal (the "ins") labor markets. Port-of-entry jobs interlink these markets and serve as evaluation districts for new initiates to internal markets.

As noted by Marshall in regard to all supply/demand interactions, it is difficult to tell which blade of the scissors is doing the cutting: the process of vocational development or the demand structure of the labor market. For example, are employers reluctant to invest in training of youthful workers because youths are inherently unstable; or, are youths inherently unstable since many of the job opportunities available to them are unstable and lacking in career potential? The answer to both questions can only be "yes," because of the particular interaction of the process of vocational development with the demand structure of the labor market.

Another example of vocational development interaction with the demand structure of the labor market is with respect to the female's

labor market role. Although the woman's role in the stable workforce is increasing as career patterns shift from "stable homemaking" to the "double-track" and "interrupted" career patterns, market work activities of many women are still intertwined with homemaking responsibilities, or at least the expectation of such responsibilities. Furthermore, the married woman's career pattern is, in general, closely related to the husband's. If the working husband is transferred to another geographic region, the wife, of course, follows. Many females work to assist their husbands through formal education preparation for professional careers after which they pursue stable homemaking careers. In consequence, female work histories tend to reflect less stability than those of men. Yet, a number of labor market activities are in accord with these female career patterns, some of which offer part-time, part-year employment particularly suited to homemaking responsibilities. Stability and training requirements tend to be low and advancement is limited. The majority of such jobs are in the clerical worker classifications, but many service and sales related occupations also display such supply/demand accommodation. One problem faces the woman who desires a permanent career: She is typed by the general career patterns of females; avenues for promotion to the top of the career hierarchy tend to be blocked.

The important observation to be made, then, is that the demand structure of the labor market is the analogue of the process of vocational development. New initiates to the labor force attempt to implement their self-concepts through a variety of work experiences. In turn, the demand side of the labor market provides a number of job types, usually at the base of the occupational ladder, which operate as

test sites. With advancement of age, education, work experience, skills and abilities and a general focusing on self-concept, labor market behavior is increasingly orderly and patterned. Trial jobs with career potential, which have greater stability requirements, become available. Career patterns of women are intertwined with homemaking responsibilities, they are less stable labor force participants, in consequence. Job opportunities, lacking in stability requirements, are available which conform to female career patterns. Some individuals possess "multiple trial" and "unstable" career patterns; their work histories are disjoint and inconsistent. They become typed as unstable and as a result, the doors to career jobs close and they are relegated to a particular low-level occupational substructure. There is, then, a good deal of conformance between the various career patterns and job availabilities.

The conformance of employee and employer preferences through the interaction of vocational development with the demand structure of the labor market tends to create a variety of submarkets. Walls between submarkets are permeable but present, particularly in the short-run. Workers within a submarket compete for available jobs in the submarket and also for higher skilled jobs which lie above and beyond the submarket. Mobility patterns are, thus, interlinked between occupations in a submarket, plus there is a tendency for common movement patterns to jobs outside the submarket.

The job cluster concept is the basis for micro-analysis of the process of interoccupational mobility. A common "locus of attention" is the distinctive feature of a job cluster. Skills and abilities of workers in a given job cluster are correlative. Frequently, ladders of

increasing responsibility develop within the situs; job classifications of less skill are logically related through promotion to those at the top of the cluster hierarchy. Transferability of workers--the range of jobs which can be adequately performed by workers of a given skill--between jobs within the cluster is high. Also, within the job cluster, substitutability--range of persons with varying skill levels who can adequately perform a given job--is high.[51]

Supply elements of vocational development and demand facets of labor market structure are integrated in the job cluster concept. Furthermore, the job cluster concept emphasizes the influence of technology. Whereas the general process of labor market accommodation is outlined by vocational development theory in conjunction with the demand structure of the labor market, the job cluster concept more sharply focuses on the specifics of that operation. Job clusters subdivide the submarkets. Thus, the first-order dimension of the occupation system is the segmentation of the labor market into submarkets brought about by the interaction of institutional and economic forces with the vocational development process. The second-order dimension takes cognizance of the role of technology in furthering the compartmentalization of the occupation system. The first-order dimension will be referred to as the "submarket domain"; the second, the "situs domain."

What are the implications of occupation system theory on questions of the extent and character of interoccupational mobility? There are several. With respect to the volume of occupational mobility, occupation system theory predicts significant and meaningful variation between the diverse types of employment. Occupations at the base of the ladder of

hierarchy should have high out-mobility rates, or, stated conversely, low rates of retention of workers from one time period to the next. These job types are "stepping stones" for transition to career potential vocations. Or, in some cases, such jobs are specifically temporary for individuals pursuing formal training in an alternative field (part-time college student workers). This is not to say that these jobs will not have stable components. Indeed, for many workers, the occupation of "sales clerk, retail" is a lifetime vocation. The bulk of participants at any point in time view such jobs as transitory. There is high turnover.

Retention rates are hypothesized to be positively related to the career status of the occupation. Particularly this is true for occupations for which incumbents have invested heavily in formal educational training. Occupations which, to an extent, represent the end-of-the-line for career advancement would also tend to have relatively high retention rates.

Occupations at the base of the ladder of hierarchy would be heavily dependent on new entrants from non-work status as a source of supply. This would also be the case for professional occupations which have high formal educational requirements. In terms of dependence on new entrants as a source of supply, "physicians" are similar to "busboys." Of course, there is substantial difference in the quality of these new entrants. To reflect this quality differential, the "entrance rates" (ENR's) to a given occupational category from non-work status will be divided into four categories by educational attainment: (1) ENR_1, less than high school completed; (2) ENR_2, completed high school; (3) ENR_3, one to three years college; and, (4) ENR_4, four or more years college.

Now the percentage frequency distribution by the ENR categories for base level jobs will be polar to the hypothesized negatively skewed distribution for professional status jobs.

Occupations at the top of the career hierarchy would tend to be less dependent on movement from non-work status as a source of supply. Previous work experience is prerequisite for career hierarchy occupations such as "managers and administrators." These job types are dependent upon occupational mobility as a source of supply, that is, movement from other occupational categories.

Occupations dominated by females would also tend to rely heavily on entrance from non-work status as a source of supply. Because of the particular patterns of female labor market behavior (school --> market work --> non-market activities --> imperfectly predictable re-entrance to labor market), the dependence of female dominated occupations on non-market work status as a source of supply has two components: initial entrance and re-entrance. Also, such occupations would tend to "feed" non-work status rather heavily; "exit rates" (EXR) to non-work status would be relatively high. Jobs of a seasonal or otherwise temporary nature would also be expected to have relatively high total ENR's and EXR's since non-work status includes unemployment.

With respect to patterns of occupational interchange and the degree of structure to such movements, occupation system theory provides a number of insights. A major conclusion from occupation system theory is that occupational movements will exhibit a positive direction: movements up the occupational ladder of hierarchy. Initially, occupational movements are an important part of the "search" process. But, the demand

structure of the labor market through employment opportunities defines and constrains the avenues for such exploration. A "youth" class and a "port-of-entry" class of jobs characterize the labor market. The distinction between these two classes is important but imprecise. Port-of-entry jobs will, however, tend to have significant attachments to jobs with career status while youth jobs will lack such potential. Many individuals engage in youth jobs on a part-time/part-year basis while preparing formally for entrance to a professional career. Spurious occupational movements such as a change from "sales clerk, retail" to "chemical engineer" may result from such labor market behavior. Out-movements from youth-type jobs, then, tend to be random in character. Movements increase in structure for jobs with greater career potential.

In the linkage structure between occupations on the basis of mobility patterns, the situs domain will dominate the submarket domain. The situs domain is, of course, conceptually narrower than the submarket domain. Elasticities of substitution and cross elasticities of supply are highest among jobs in a particular situs. Thus, the occupation system is divided into submarkets which are further divided into situses. Situses have a technological orientation (machines, tools, research and design); submarkets, a class of worker orientation (unskilled, semi-skilled, skilled, clerical, and professional). Promotion, transfer and substitution possibilities are greater within situses than within submarkets. The structure of interoccupational mobility would be expected to reflect technological considerations first and submarket factors second.

<u>Summary and Conclusion</u>

In this chapter, theoretical rationale for the expectation of structure to interoccupational flows of manpower were explored. Vocational development theory, labor market structure theory and the job cluster concept were integrated to form a composite theory which predicts substantial variation in volume and pattern of movements among the various job types. Vocational development provides the conceptual foundation for supply aspects of individual labor market behavior--the process of accommodation and adaptation. Labor market structure theory provides insights into labor market operation from the demand side of the equation--importance of institutional and economic factors in the demarcation of labor market boundaries. Labor market behavior patterns of individuals combine with the structural aspects of the labor market to produce a system of submarkets.

An even sharper focusing on a structural theory of interoccupational mobility is made possible by the job cluster concept. A variety of job types spring forth from the different forms of technology such that skill requirements are correlative and, thus, relatively interchangeable. Transferability of skills between job types augments supply cross elasticities. The fact that skill requirements are correlative raises the elasticities of substitution between job types interrelated through commonalities in production. Thus, from both supply and demand considerations, workers have greater willingness and ability to move between technologically interrelated forms of employment. Consequently, technology plays a very important role in the structural theory of

interoccupational mobility (occupation system theory), a role which is narrower and more specific than that of the submarket factor.

Evidence on the volume and pattern of occupational mobility is fragmentary. It is to a review of such evidence that we now turn.

FOOTNOTES

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CHAPTER III

METHOD AND EVIDENCE: PREVIOUS INVESTIGATIONS

The structure of occupational mobility has not been the central issue in the numerous past investigations of labor mobility. Two general reasons can be cited for the failure of past investigations to incorporate this research question. Lack of a substantial data base necessary to conduct such a disaggregated study is one reason. Most studies have not had the sample size necessary for such an investigation. For example, the "Six Cities" survey conducted by Gladys Palmer, et al., employed 269 detailed occupational categories in coding respondents. But, the necessarily limited sample size of 13,000 work histories required that the detailed categories be aggregated in conformity with the Census one-digit level groups.[1]

Methodological problems of handling large data sets and modeling the research question formed the second barrier to implementation. The methodology for handling and interpreting a vast number of categories did not exist. Although one may be able to readily interpret the interchange between a small number of categories, such "eyeballing" techniques are not feasible in attempting to discern the patterns of mobility of hundreds of categories. Thus, in order to analyze such a large number of categories, it became necessary to explicitly model the research question. There was little incentive for the construction of such models for interpreting a large number of disaggregated categories when the data base for examination of occupational mobility on such a detailed level did not exist. Also, it is safe to say that a prerequisite

technological advance for the implementation of such models was the computer. Without automated data manipulation devices, large scale undertakings such as a detailed assessment of occupational interchange were, for all intents and purposes, impossible.

Needless to say, then, the evidence from past investigations of labor mobility is not replete with detailed examinations of patterns of occupational movement. Also, those investigations that have been undertaken have employed a socio-economic aggregation scheme of the detailed titles which, as will be discussed in Chapter IV, is inadequate from a labor market standpoint. Yet, from past investigations of labor mobility, much is to be learned. Through review of such literature one can gain familiarity with the varied techniques of studying mobility and garner insights into possible avenues for improvement of method. Also, hypotheses can be developed from the findings of past studies which are applicable to the current research question. In addition, by knowing the questions that have been answered, one can more sharply focus his attention on the remaining topics.

In this review, particular attention will be devoted to evidence suggestive of pattern or structure to occupational mobility. Evidence of the correlates and purposiveness of mobility will be examined when such findings have implications for the extent and character of mobility question. Special emphasis will be given to the methodological content of the various investigations. First, evidence on the volume of labor mobility and its counterpart, job tenure, will be examined. In the final section, some implications of the various findings of past investigations on patterns of mobility will be examined.

Volume of Labor Mobility

The literature on labor mobility is replete with evidence in support of the following statements: 1. There is a substantial amount of permanency to employment such that a considerable number of workers do little moving between employers, industries, occupations or localities; 2. there exists a considerable amount of movement in the labor market such that the velocity of movement is a substantial proportion of jobs in existence at any point in time; 3. age of worker is the fundamental demographic variable in predicting labor mobility of the various sorts; and, 4. the volume of labor mobility is inversely related to the status hierarchy of occupations. Several studies in support of the above statements can be cited. Generally, labor mobility investigations have yielded results comparable to the findings of Bancroft and Garfinkle.[2] These investigators found that during 1961 approximately 10 percent of 80 million workers aged fourteen years and over who worked at sometime during the year changed employers. This rate of movement was found to be about one percent less than that reported for the year 1955 which was a time of more rapid economic expansion than the 1961 period. The total of 10.9 million job shifts were accounted for by 8.1 million individuals for an average of 1.3 job changes per mobile worker. Males in the 20 to 24 years of age bracket had the highest percentage of job changers while for females, the 18 to 19 years of age bracket was the modal group with 22.2 percent mobile.

Although the total number of shifts were approximately equal in comparing the 1961 period with 1955, in examining mobility by reason for leaving job a contrast between the two periods is evident. For all

age and sex categories, a lower percentage was recorded in 1961 than in 1955. Those listing job loss as the reason for leaving were greater in percentage terms in 1961 than in 1955 in all instances except one. Improvement in status balanced out with job loss as reason for movement in 1961 at 5.3 job shifts per 100 persons who worked while for the 1955 period improvement in status was 2.5 points above the job loss rate at 6.7 job shifts per 100 persons.[3]

Job shifting decreases rapidly with age and there is substantial variability between occupational categories in amount of job changing. The rate for those 45-64 year old males in 1961 was less than one-fourth the rate for males 20-24 years of age. Among the males, the lowest rate of job changing was found within the "farmers and farm managers" category while the category of "managers, officials and proprietors" followed closely. "Laborers, except farm and mine" recorded the largest rate of job changing basis longest job held in 1961. For females, the largest rate of job change was found in the "service worker, except private household category."[4]

Bancroft and Garfinkle also found that attachment to occupation is somewhat stronger than attachment to industry. For males, however, the complex shift of change of occupation <u>and</u> industry was the most common type. Job shifts within the same major occupation and major industry groups were the second most frequent shift at approximately one-third of all job shifts. For females, the complex shift, change in occupation <u>and</u> industry, was of equal importance to the simple shift (change of employer without movement across major occupation and industry groups boundaries). Such shifts accounted for 34 percent of

all moves for each type. Movements involving a shift of industry only were more frequent for males and females than the counterpart shift of occupation only. Nevertheless, the complex job shift was the more common type of shift in attempts by workers to improve status.[5]

Not surprisingly, the "professional and technical" occupational group exhibited a substantial amount of retention. Sixty-five percent of males in this category who changed employers remained within this same major occupational group while for females the rate was 75 percent. The "craftsmen" group had a rate of retention of 68 percent for males. The "clerical" worker category displayed a substantial amount of retention of job shifters for females with 70 percent retention. The "sales" worker category had the lowest degree of retention at 32 percent for men. Females in the "private household" category were among the most likely to move across their occupational boundary to other groups.[6] The varying degrees of attachment to the major occupation groups signify that there is substantial interchange across major group boundaries. Such large scale movement across these major group boundaries is a possible indication of heterogeneity of these groups.

The counterpart of mobility is job tenure. Studies on job tenure indicate a substantial amount of stability in the employment of the American worker. In a study conducted in the early 1960's by Hamel, he found that approximately 10 percent of the 66 million workers employed in January, 1963 had held the same job (defined as constant employer) since at least 1942.[7] In contrast, approximately one-fourth of all workers had held the same job for one year or less. A job was defined as a continuous period of employment with a single employer for wage and

salary workers; for self-employed workers, a continuous period of employment at a particular type of business in the same locality. The median years on current job was 4.6 for all employed workers. The median figure for males was 5.7 years and for females, a substantially lower 3.0.[8]

Substantial variation in tenure by age was noted. For all employed persons in the 14-24 years of age category the median years in current job was .8 while for those workers of age 45 years and over the median years on current job was 10.4.[9]

Furthermore, there was substantial variation of tenure within the major occupation group categories. "Farm laborers and foremen" and "laborers, except farm and mine" had the lowest median years on current job. "Farmers and farm managers" recorded an 18.0 median years on current job followed by the "managers, officials and proprietors" group at 8.4. For women, the "farm laborers and foremen" group, many who are likely unpaid family workers, recorded the highest level of tenure (9.9). This is followed by the "managers, officials and proprietors" group (5.8). Lowest median years on job for females was, understandably, recorded for workers in the "private household" category at 1.7.[10]

More recent evidence on job tenure is presented by Edward J. O'Boyle.[11] As is shown in Table 3.1, O'Boyle found monotonic increasing relationships between age and job tenure for both males and females up to the age of retirement. Job tenure was greater for males than females and greater for whites than non-whites. Job tenure by major occupation group, age and sex was found to be substantially variable. Job tenure was less than one year for males and females between the ages of 16-24

Table 3.1

Median Years on Current Job, January 1968[12]

Age	All Persons: Men	All Persons: Women	Men: White	Men: Non-white	Women: White	Women: Non-white
Median years on job	4.8	2.4	5.0	3.3	2.4	2.0
16 and 17 years	.5	.5	.5	.4	.5	N/C*
18 and 19 years	.5	.5	.5	.4	.5	.4
20 to 24 years	.8	.9	.8	.7	.9	.8
25 to 29 years	2.1	1.4	2.2	1.9	1.4	1.3
30 to 34 years	3.9	1.8	4.0	3.1	1.8	1.8
35 to 39 years	5.8	2.6	6.0	4.1	2.4	3.2
40 to 44 years	8.4	3.2	8.7	5.8	3.2	3.4
45 to 49 years	10.2	4.4	10.4	8.8	4.4	4.1
50 to 54 years	12.6	6.2	12.8	10.1	6.1	6.8
55 to 59 years	14.7	8.2	14.9	11.9	8.3	7.4
60 to 64 years	15.1	9.4	15.5	11.7	9.6	8.6
65 to 69 years	12.4	10.5	12.6	11.1	10.5	N/C*
70 years and over	16.0	9.1	16.3	N/C*	8.7	N/C*

* Not Calculated

years for all occupational categories indicating a substantial amount of churning in these early years of employment. For the age group 25-44 years, median years on current job was under five years for males in all but two of the aggregate major group categories and in all but one of said categories for females. Substantial variation in job tenure among the major occupation groups, which is minimal at the lower age categories, becomes quite evident for those workers 45 of age and over. For male, non-farm workers, the rank ordering of major groups by tenure is as follows: clerical and kindred workers; managers, officials and proprietors; craftsmen; operatives; sales workers; laborers; and service workers. Interestingly, male "clerical and kindred" workers in this oldest of the age groups analyzed have greater tenure than both the "professional and technical" category and the "managers, officials and proprietors" major groups.[13] Apparently there are detailed categories in the "clerical" group which offer substantial career opportunities to males.

The evidence offered above from the acknowledged sources appears to validate the statements which initiated this section. The labor market is characterized by a substantial volume of movement and, yet, strong attachment. Age of worker appears to have considerable predictive power in assessing the likelihood of movement and, conversely, attachment. Also, there are significant differences in mobility and tenure between the aggregative major group occupational categories. In general, the greater the amount of training, experience, and education involved in an occupation, the lesser is the rate of mobility. Furthermore, the larger is the magnitude of median years of tenure.

The Volume of Occupational Mobility--Detailed Category Level

In the studies cited above, references to occupational mobility or tenure were on the basis of the broad aggregate major occupational groups. Furthermore, an individual who is transferred to a different job within the same establishment was not counted as a job shifter in the definitional base employed in the above investigations.

A turn to the more detailed analysis, at least in terms of a definitional base for mobility, while admitting job resignments with the same employer, is found in the Samuel Saben study of occupational mobility of employed workers.[14] Individuals who worked in both January, 1965 and January, 1966 were classified according to a system of 296 detailed categories of the 1960 Census Occupation Classification System. Approximately eight percent of the almost 70 million workers employed in both periods changed detailed occupational categories. The time period under analysis was one of considerable economic expansion with the unemployment rate at a seasonally adjusted 3.9 percent in January, 1966 which is, of course, conducive to mobility. A majority of occupation changers (60 percent) were under 35 years of age even though this demographic group accounted for only slightly over one-third of all employed persons in January, 1966. Although a majority of changes of occupation were found to be accompanied by a change of employer, roughly 20 percent of all occupation shifts were recorded within the same establishment. This indicates that there has been substantial understatement of occupational mobility due to neglect of intra-firm transfers in investigations which do not consider such shifts.

Substantial variability in occupational mobility by age, sex, and color is indicated in Table 3.2. Occupational mobility rates are seen to

monotonically decrease with age for the sex and sex color groups. Again, occupational mobility was greatest for the youth categories. Thirty-two percent of all males 18 and 19 years of age who were employed in both periods shifted detailed occupational categories. The rate of occupational changing at the detailed level for males was three percentage points greater than that for females. For non-white males, the rate of shifting was somewhat higher than that for white males. There was little difference between white and non-white women in rate of occupational changing.

There was also substantial variability between occupational categories in rates of movement. For males, "laborers, except farm and mine" had the highest rate of occupational mobility. 10.8 percent of women in the "craftsmen and foremen" category were occupationally mobile as defined on the 296 detailed category level. Rates of mobility were lowest for the "farm and farm managers" group for both males and females.[15]

Table E in the appendix of Saben's Special Labor Force Report illustrates the magnitude of hidden information that results from the use of broad occupational categories in the study of occupational mobility. Table 3.3 reproduces some of these statistics. Examination of the table reveals, for example, that 32 percent of male "professional and technical" workers who changed occupation shifted to an occupation still within the same broad category. Certainly, a great deal of relevant information is lost by use of the broad classifications. "In any study of mobility, the more disaggregated the classification the more inter-class mobility will appear and the more accurate will our

Table 3.2

Occupational Mobility Rates Between January 1965 and January 1966 of Employed Persons by Age, Sex, and Color, January 1966[16]

	All Persons		White		Non-white	
Age	Men	Women	Men	Women	Men	Women
Total, 18 years and over	9.9	6.9	9.6	6.8	12.4	7.1
18 and 19 years	31.7	29.0	31.8	28.3	N/C*	N/C*
20 to 24 years	28.5	14.9	28.4	14.4	29.2	19.0
25 to 34 years	13.8	8.5	13.5	8.3	16.8	9.7
35 to 44 years	7.4	5.3	7.2	5.5	9.5	4.3
45 to 54 years	5.2	4.7	5.1	4.8	6.6	3.8
55 to 64 years	3.8	2.4	3.8	2.6	3.7	1.2
65 years and over	2.7	1.8	2.7	1.6	3.5	N/C*

* Not Calculated

Table 3.3

Percent of Occupation Changers by Major Occupation Group Who Remained in Same Major Occupation Group[17]

	Men	Women
Professional, technical and kindred workers	32.8%	38.9%
Managers, officials and proprietors except farm	8.7	N/C*
Clerical and kindred workers	27.2	64.4
Sales workers	13.2	7.5
Craftsmen, foremen and kindred workers	24.6	N/C*
Operatives and kindred workers	35.9	41.5
Service workers	17.1	40.4
Laborers	9.3	N/C*

* Not Calculated

picture of events be."[18] Past studies have relied heavily on the use of the broad occupational groups in the study of occupational mobility which tends to hide much of the nature and form of occupational mobility patterns. It must be noted, however, that reliance on the broad occupational groups was necessary due to inadequacy of sample base.

Given the significance of age as a factor in mobility, it is interesting to note some of the sample results from the National Longitudinal Survey of young male workers. Employing the Saben definition of occupational mobility in examining movement over a two year period, it was found that 59 percent of white male youth and 69 percent of black youth were occupationally mobile.[19] The universe included out-of-school youth 21-25 years of age who were employed in each of three survey weeks in 1966, 1967, and 1968. The rates of mobility found by Kohen and Parnes were substantially above those found in the Saben study. Several reasons were given for this differential including specification of the universe, method of sampling, and differences in time periods.

Again, there appears, for the youth groups, to be a close association between occupational shifting and change of employers. Yet, for those who remain with the same employer at each of the three survey dates, the rate of occupational mobility was as high as one-third for both color groups.[20]

Defining an upward occupational move in relation to the Duncan Socio-Economic Status Index, Kohen and Parnes roughly illustrate that upward occupational mobility predominated over downward moves. Approximately one-half of the occupational moves by white youth were considered upward by their schema, one-fourth downward, and one-fourth inconclusive. For black youth, the proportions were, respectively, about two-fifths,

one-third, and one-fourth. It was found that intra-firm changes in occupational assignment were slightly more likely to result in upward moves than were changes in occupation and employer.[21] For an important segment of the occupationally mobile, i.e., male youth, occupational mobility is seen as an important mechanism for improvement in job status.

Importance of Occupational Mobility

Changes in the occupational distribution of workers can come about for a variety of reasons, only one of which is occupational mobility. For example, the job choices of new entrants into the labor market could, over time, have considerable impact on the percentage distribution of workers among the various job types. Differentials among occupations in rates of retirement from the labor force would be another possible component of change in the employment distribution. Obviously, considerable change in the percentage distribution of employment among occupations is possible with little or no mobility of workers between job types.

Some evidence of the relative importance of these various components of occupational change is offered by Jaffe and Carleton.[22] Using a cohort-component model, the purpose of which is to allocate changes in the size composition of an occupational class for a cohort of workers into various components for change, Jaffe and Carelton found that of the three factors which determine the number of employees in a given occupation (new entries, retirements, and net-mobility)[23]:

> the single most important component is the volume and direction of net-mobility. Occupations which grow rapidly are those into which there is considerable net-mobility. Large numbers of new entries from among

> youths who are entering the work force is not enough to insure the growth of an occupation. On the other hand, the occupations which either grow slowly or decrease in size do so because of large-scale out-mobility rather than because of retirements or deaths.

Thus, occupational interchange as evidenced by residual net-mobility flows of manpower is the predominant determinant of change in the size distribution of occupational employment.

Aronson has extended the Jaffe and Carleton model to the 1950-1960 period while also greatly expanding the level of detail of the analysis to 119 occupation categories.[24] In analysis of the components of change for the 119 detailed occupational categories studied by Aronson, he arrives at an essentially similar conclusion to that of Jaffe and Carleton: "the outstanding result is the clear dominance of movement among occupations, that is, net-mobility, in accounting for the decade change in the size of occupations. Although net-mobility shared honors evenly with new entries in 1950-60, as the largest component of change in the ten-group analysis, among the detailed occupations, mobility displaced new entries to second rank as a source of occupational change."[25]

In the table below, Aronson's results are capsulized. For construction of this table, each of the 119 detailed occupations were first allocated to their respective major occupation group and then distributed to one of the major components of change by largest single component of change. Thus, two-thirds of the occupations in the "professional, technical and kindred worker" category had in-mobility as the largest single component of change. For all the detailed categories analyzed of the male labor force, net-mobility was the strongest

Table 3.4

Largest Single Components of Occupational Change, 119 Detailed Occupations, Male Labor Force, 1950-1960[26]

Major Occupational Group	Total Number of Detailed Occupations	Number of Occupations in Which Largest Single Component of Change Was:				
		New Entries	Deaths	Retire-ments	In-Mobility	Out-Mobility
Professional, technical and kindred workers	18	6	--	--	12	--
Farmers and farm managers	2	--	--	1	--	1
Managers, officials and proprietors	15	--	--	3	12	--
Clerical and kindred workers	8	5	--	--	3	--
Sales workers	6	2	--	--	4	--
Craftsmen, foremen and kindred workers	27	11	--	5	11	--
Operatives and kindred workers	19	12	--	2	2	3
Service workers	12	5	1	1	4	1
Farm laborers and foremen	3	--	--	--	1	2
Laborers except farm and mine	9	5	--	--	--	4
ALL OCCUPATIONS	119	46	1	12	49	11

component of change in nearly one-half of the cases. New entries, ranked second, dominated in slightly over one-third of the detailed occupational categories.

The use of the detailed categories in the cohort-component model has dramatized the importance of occupational mobility in the allocation of labor resources. Particularly, this is evident with the major occupational group of "sales workers." Although new entries dominated the growth of this major occupation group in the aggregate analysis, only in one-third of the detailed sales occupations was new entries the predominate factor. Thus, the importance of disaggregative and detailed analysis in bringing forth a clearer picture of events is illustrated in Aronson's findings.

The cohort-component model of Jaffe and Carleton, although of considerable importance in pointing out the significance of occupational mobility in the labor allocation process, has severe limitations in terms of the research questions of interest in the present analysis. One major limitation is the inability of the model to ascertain gross flows of labor. Further, even though occupational mobility can be shown to be an important factor through such analysis, the exact occupational sources of manpower into any particular category cannot be determined. In addition, the design of the cohort-component model necessitates the assumption of continuous labor force participation; consequently, the model, as currently specified, is incapable of analyzing women. Nevertheless, such analysis provides a much clearer picture of the role of labor mobility between job types in the process of labor resource allocation as well as the significance of new entrants into the job

market. As will be seen in the following section, such cohort-component analysis also offers evidence suggestive of structural patterns to occupational mobility.

Patterns of Mobility

Knowledge of the pattern of occupational mobility is crucial to an assessment of labor supply flexibility. Given a fixed volume of mobility, a conclusion on the flexibility of the supply of labor can still vary quite greatly even though the volume of occupational mobility may be substantial. For instance, it may be found that a substantial proportion of the mobility occurs only at the lower levels of skills. Or, mobility may be found only among narrowly defined job types. Or, it may be found that there is substantial isolation of certain categories of jobs from other occupations. Thus, a substantial volume of mobility is not inconsistent with a finding of inflexibility in the supply of labor.

Very little evidence exists on patterns of occupational mobility. What little evidence there is is based on the highly aggregative Census major occupational groups. Such a sample base tends to hide many relevant and interesting relationships in the labor reallocation process. Consequently, the evidence that is available is largely suggestive of the existence of patterns rather than the actual form and character of occupational mobility patterns. Even though the conclusions on patterns that have been reached are consistently of the most general nature, the evidence that has been compiled suggests the existence of structure to manpower flows between job types.

As an example of the broadness and generality of conclusions related to patterns of occupational interchange, Palmer found "that

there was more movement between related than between unrelated groups of occupations. That is to say, shifts of manual workers were more likely to occur between laborer, service, operative, and craftsmen groups than between manual and non-manual occupations...."[27] Additional evidence for men in four of the cities showed that most movement up and down the ladder of hierarchy occurred between adjacent groups, especially when shifts to self-employment and "foremen" were disregarded. Furthermore, strong interchange between the two groups of "craftsmen" and "foremen" was evident. Palmer also offered evidnece that the supply of "professional and technical" workers can be increased only through additional training procedures while for the "craftsmen" group it was found that experienced workers, particularly those formerly employed as operatives, were an important source of supply.

There exists a large number of sources from which conclusions similar to those of Palmer would be drawn: Gordon[28]; Lipset and Bendix[29]; Blau[30]; Reynolds[31]; and, Goldstein.[32] Most of these studies tend to confirm what Goldstein calls "perhaps the most fundamental cleavage," i.e., the lack of substantial interchange between manual and non-manual occupations.[33] Lipset and Bendix estimated that manual workers spent 80 percent of their working lives in manual occupations while the rate was 75 percent for non-manual workers.[34] The "Six Cities" study showed retention rates of 89 and 80 percent for the manual and non-manual groups for the years 1940 and 1950.[35] Goldstein employed his "fundamental cleavage" concept in explaining the relative stability of "craftsmen" and "professionals" in that these groups are at the top of their respective hierarchy. There is little opportunity for advancement and certainly no incentive for movement to lower categories.

Considerable evidence suggestive of patterns in occupational mobility is derived from the cohort-component model in Jaffe and Carleton followed by the Aronson extension. Jaffe and Carleton found: 1. considerable net-out-mobility from "clerical" workers and "laborer" classifications; 2. a balancing of net-mobility for "sales" workers and "operatives"; and, 3. considerable net-in-mobility for all other classes of occupations.[36] In Aronson's detailed analysis an even clearer picture emerges of the potential for patterns of occupational interchange. New entries were found to play a relatively minor role in changes in size of the white collar occupations compared with in-mobility. Aronson notes that "in-mobility alone is the largest single component of change in more than three-fifths of these occupations."[37] Among the occupations in the white collar categories which were heavily dependent upon new entries as a source of supply, a number of these occupations are characterized by having long, relatively standardized programs of formal education. Obvious candidates include clergymen, dentists, designers, engineers, lawyers, professors, physicians, and teachers. New entries were found to be relatively more important in several of the technical type occupations such as accountants, draftsmen, and medical technicians.

With respect to the remaining white collar occupations, fewer generalizations are possible. New entries balanced with in-mobility as components of change for "clerical" and "sales" workers. With respect to the fifteen categories of "managers, officials and proprietors," in-mobility, however, has clear domination. As stated by Aronson, "upgrading through on-the-job training and experience may very likely be the operative factor explaining the importance of mobility in the managerial group."[38]

The blue collar and service categories analyzed by Aronson were dominated by new entries as the component of change in a ratio of about two to one relative to the importance of in-mobility. For the "craftsmen and foremen" group, there was a balancing of importance of new entries to net-mobility while for the "operatives" category, new entries was the most important component in two and one-half times as many detailed categories. For service workers and laborers, there was also a balancing of new entries and net-mobility. It is interesting to note that nine out of the eleven instances of domination of out-mobility occurred among occupations in the "operative," "service," and "laborer" classifications. Aronson's contention is that "these occupations are principal 'ports of entry' for many of the new entrants into the male labor force but are rarely terminal jobs."[39]

Blau and Duncan also offer evidence consistent with the hypothesis of structure in the occupational flow of manpower. Although these authors were mainly interested in inter-generational flow of manpower and, thus, the process of occupational inheritance, one matrix of occupational mobility generated by Blau and Duncan is of considerable importance to the topic at hand: mobility from "first job" to "respondent's occupation in March, 1962." In the following table, the mobility matrix between 17 occupational categories for males 25 to 64 years of age is presented. This matrix is referred to by Blau and Duncan as the out-flow or supply matrix since the "i,j" element expresses the percentage of those who had occupation "i" as their first job and occupation "j" as their job in March, 1962. Thus, 4.7 percent of those that had a "self-employed professional" occupation as their first job were "salesmen,

Table 3.5

Mobility from First Job to 1962 Occupation, for Males 25 to 64 Years Old: Outflow Percentages[40]

First Job	Respondent's Occupation in March, 1962: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total[a]
Professionals																		
1 Self-Empl.	53.5	25.5	1.8	4.7	2.5	1.5	.0	1.5	.7	.0	.7	.0	.0	.0	2.5	.0	.7	100.0
2 Salaried	6.5	54.5	12.3	2.8	5.5	4.9	.4	1.6	2.0	.4	1.2	1.2	1.0	.1	.3	1.0	.1	100.0
3 Managers	1.2	20.4	35.7	4.3	9.1	6.6	2.3	2.3	4.1	2.9	2.1	1.4	1.2	.6	1.2	.6	.4	100.0
4 Salesmen, Other	.6	8.5	25.1	23.7	12.4	5.0	2.8	.6	3.3	1.3	5.4	3.9	2.8	.0	.0	.4	.0	100.0
5 Proprietors	.9	6.8	19.2	6.4	36.3	2.6	2.6	1.7	2.1	.4	4.3	4.3	3.0	.9	2.1	3.8	.0	100.0
6 Clerical	1.6	13.0	17.3	7.3	5.4	17.6	1.8	4.6	4.3	2.6	5.6	4.2	4.4	1.0	1.8	1.2	.2	100.0
7 Salesmen, Retail	2.1	10.0	15.6	7.4	11.6	11.6	5.1	4.5	4.8	2.9	6.1	7.4	3.1	1.1	1.9	1.0	.1	100.0
Craftsmen																		
8 Mfg.	.9	8.7	7.8	2.5	12.2	4.1	.7	22.5	7.5	4.3	9.1	3.5	3.7	.8	4.0	2.3	.0	100.0
9 Other	.3	9.0	6.6	1.9	10.3	4.1	3.4	10.9	21.3	4.7	7.1	5.5	3.6	1.4	1.7	1.2	.7	100.0
10 Construction	.3	5.6	3.4	1.6	11.1	3.1	.2	8.8	13.2	26.2	5.0	4.3	2.4	1.0	3.1	2.1	.8	100.0
Operatives																		
11 Mfg.	.4	6.1	5.3	2.0	7.0	6.2	1.7	13.4	6.7	4.6	18.8	7.6	4.7	3.2	3.5	2.0	.6	100.0
12 Other	.5	5.0	6.1	3.0	8.7	4.3	1.1	7.3	10.8	6.9	9.6	15.0	6.0	1.4	4.3	1.8	1.0	100.0
13 Service	.5	7.1	4.9	1.4	6.2	5.0	1.2	3.4	6.4	6.2	13.3	7.7	19.8	2.5	5.8	.4	.5	100.0
Laborers																		
14 Mfg.	.3	5.5	3.9	1.5	2.9	6.2	1.2	10.5	5.3	3.9	18.1	8.8	7.3	8.2	6.3	1.6	1.7	100.0
15 Other	.2	5.5	5.4	2.4	6.7	4.1	1.3	6.1	9.6	6.8	10.5	10.8	6.3	2.4	11.5	2.1	.9	100.0
16 Farmers	.2	2.3	2.6	1.8	3.8	3.0	1.2	4.2	5.9	5.4	8.3	5.0	4.6	1.4	3.6	30.0	5.0	100.0
17 Farm Laborers	.2	1.7	2.4	.8	4.7	2.7	1.1	5.3	6.3	5.5	10.4	9.3	5.8	2.8	6.7	19.3	7.0	100.0

[a] Rows as shown do not total 100.0, since men not in the experienced civilian labor force are not shown separately.

other" in March, 1962. This matrix is essentially diagonal since, in general, the largest entries of each row occur along the main diagonal of the matrix. This is evidence of the tendency for self-supply in occupational categories. The main diagonal elements can be viewed as "retention rates." There are notable exceptions to this main diagonal domination. For example, workers in the "salesmen, other" category had a greater propensity to become "managers" than retain their occupational status. For the category of "salesmen, retail," seven of the off-diagonal elements are larger than the retention rate of 5.1 percent. Similarly, "laborers" in the manufacturing sector were found to have high rates of out-mobility with several off-diagonal entries of greater value than the retention rate. This is also the case with respect to "farm laborers."

Even though the major concern of the Blau and Duncan study was the inter-generational flow of manpower, the work of these investigators has been a considerable motivating source, particularly with respect to methodology, to this investigation. Denoting their survey as "occupational change in a generation" (OCG), the sample base was national in scope and implemented as an adjuct to the monthly "Current Population Survey" of the U.S. Bureau of the Census. Use of this sample procedure resulted in a sample size of approximately 20,000 men in the age bracket of 20 to 64 years of age. The advantages of the occupational mobility model employed by Blau and Duncan are readily apparent over those of the cohort-component model: The directional flow of manpower between occupations is evident.

Also, Blau and Duncan used several innovative techniques in attempts to analyze the dimensions of social distance between the various

occupational categories. One such method was the construction of a "dissimilarity" value between each of the occupation pairs through comparison of the out-flow distributions (the sum of the positive percentage differences). The resulting matrix of dissimilarity values was summitted to a "Guttman-Lingoes Smallest Space Analysis" program which attempts to assess the patterns of interrelationship in the dissimilarities matrix.[41] Such a summarizing technique becomes increasingly necessary as one expands the level of disaggregation.

Summary and Conclusion

Evidence from a variety of sources on both the volume and pattern of labor mobility has been examined above. This evidence indicates considerable mobility of young workers. Indeed, mobility of youths between jobs is a substantial proportion of total movement. In contrast, it has been shown that between the ages of 25 to 65, workers display a remarkable degree of attachment to employer, industry, and occupation. Such attachment, however, varies directly with respect to the skills, abilities, and responsibilities as defined by the task performed. From cohort-component model studies, it has been shown that movement between job types is an important allocator of labor in comparison to the other components of change. Yet, variability in the importance of occupational mobility between job types suggests that certain occupations serve as "ports of entry" for new initiates into labor market. Furthermore, evidence from the work of Blau and Duncan shows that there are differential proximities between occupations based on comparative analysis of the distributional flow patterns of the occupational categories. Thus, there is preliminary evidence suggestive

of patterns to the flow of manpower between occupation types. Yet, much of the form and character of the patterns of manpower flow are hidden by lack of disaggregation of the major occupational groups.

From the evidence presented thus far, one obtains a composite view of the operation of the labor market. From demographic differentials in the mobility of labor, it is apparent that there is considerable searching on the part of youth before a stable employment situation is encountered. Much of such movement is likely random in character with the youthful worker attempting several employment types before "finding himself" in the job market. On the other hand, once an individual has a foothold in the labor market with respect to a particular employer or career occupation, one would expect moves undertaken by such an individual to be more orderly and within a specific range of functions. Many avenues of promotion are open only after considerable tenure with a particular employer. Thus, one is given the impression of considerable turnover in jobs characterized as "ports of entry" with increasing stability, attachment, and orderly movement as the worker progresses up the occupational ladder.

FOOTNOTES

[1]Gladys Palmer, Labor Mobility in Six Cities (New York: Social Science Research Council, 1954).

[2]Gertrude Bancroft and Stuart Garfinkle, "Labor Mobility in 1961," Monthly Labor Review 86 (August 1963): 897-906.

[3]Ibid., p. 898.

[4]Ibid., p. 903.

[5]Ibid., p. 905.

[6]Ibid.

[7]Harvey R. Hamel, "Job Tenure of American Workers, January 1963," Monthly Labor Review 86 (October 1963): 1145-1152.

[8]Ibid., p. 1147.

[9]Ibid.

[10]Ibid., p. 1149.

[11]Edward J. O'Boyle, "Job Tenure," Monthly Labor Review 92 (September 1969): 16-23.

[12]Ibid., p. 18, Table 1.

[13]Ibid., p. 19.

[14]Samuel Saben, "Occupational Mobility of Employed Workers," Monthly Labor Review 90 (June 1967): 31-38.

[15]Ibid., p. 34.

[16]Ibid., Table 2.

[17]Samuel Saben, Special Labor Force Report No. 84, U.S. Department of Labor, Bureau of Labor Statistics (June 1967), Table E.

[18]Laurence C. Hunter and Graham L. Reid, Urban Worker Mobility (Paris: Organization for Economic Cooperation and Development, 1968), p. 78.

[19]Andrew I. Kohen and Herbert S. Parnes, Career Thresholds, Volume 3 (Columbus, Ohio: The Ohio State University, Center for Human Resource Research, 1971), p. 90.

[20]Ibid., p. 92.

[21]Ibid.

[22]A. J. Jaffe and R. O. Carleton, Occupational Mobility in the United States, 1930-1960 (New York: King's Row Press, 1954).

[23]Ibid., p. 23.

[24]R. L. Aronson, Components of Occupational Change in the United States, 1950-60 (Ithaca: New York State School of Industrial and Labor Relations, 1969).

[25]Ibid., p. 41.

[26]Ibid., p. 42, Table 13.

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[28]M. S. Gordon, "The Mobility of San Francisco Workers, 1940-1949," unpublished report (Berkeley: University of California Industrial Relations Section, 1951).

[29]S. Lipset and R. Bendix, "Social Mobility and Occupational Career Patterns," American Journal of Sociology (January 1952).

[30]P. M. Blau, "The Flow of Occupational Supply and Recruitment," American Sociological Review (August 1965).

[31]Lloyd G. Reynolds, The Structure of Labor Markets (New York: Harper and Brothers, 1951).

[32]S. Goldstein, "Migration and Occupational Mobility in Norristown, Pa.," American Sociological Review (1955).

[33]Hunter and Reid, Urban Worker Mobility, p. 85.

[34]Lipset and Bendix, "Social Mobility," p. 371.

[35]Palmer, Labor Mobility, p. 93.

[36]Jaffe and Carleton, Occupational Mobility, p. 28.

[37]Aronson, Components, p. 43.

[38]Ibid., p. 44.

[39]Ibid.

[40]P. M. Blau and O. D. Duncan, The American Occupational Structure (New York: John Wiley and Sons, Inc., 1967), p. 31, Table 2.4.

[41]Ibid., p. 74, Figure 2.2.

CHAPTER IV

PROBLEMS OF CONCEPT AND METHOD

A number of conceptual and methodological problems arise in the study of interoccupational flows of manpower. For example, conclusions reached in empirical assessments of volume and pattern of occupational mobility are largely dependent upon both the system of classification of occupations and the choice of mobility measure. Occupational mobility is, of course, defined as a shift from one category to another. In general, the more detailed the classification base, the greater the extent of occupational mobility. Also, investigators have had to rely on "actual movement" of individuals in assessments of the labor allocation process. Such reliance restricts the generalizability of the results since the volume and pattern of actual movement is functionally related to the social and economic environment in the time period under analysis. Parnes provides an example: "Under ordinary circumstances, female school teachers or department store clerks do not have the 'ability' even with training to become aircraft riveters, but during World War II literally thousands of women made such shifts."[1]

Actual movement, moreover, is not in correspondence with the true economic meaning of mobility. Incentives for movement need to be taken into account if the measure of mobility is to come closer to the conceptual meaning of the term: A change in earnings differentials between two categories of jobs may, through the effect on willingness to move, affect actual movement patterns. Although aware of the theoretical

meaning of mobility, economists have had little success in developing empirical measures with economic content.

It is the purpose of this chapter to examine some of the conceptual problems of occupational classification and mobility measurement. With respect to the problem of occupational classification, the discussion will focus on the work of the U.S. Bureau of the Census. The main features of the Census Occupation Classification System (COCS) will be assessed. Criticisms of COCS from the academic community will be presented. Properties of the Scoville reclassification scheme, offered as an alternative the major group categories of COCS, are reviewed. The Census response to the academic critique, manifest in many revisions of the 1970 COCS, is examined.

With respect to problems of the second type, measurement of mobility, three topics will be discussed. First, the different conceptual ways of viewing the labor mobility process will be examined. Second, the effect of the length of time period on volume and pattern of labor mobility will be discussed. The third topic is concerned with problems of reliability in the reporting of historical work status. Retrospective response to previous work status questions have been the principal means of gathering labor mobility data. The question of work and occupation status "five years ago" was included in the 1970 Census questionnaire, five percent data. Responses to this question along with the 1970 reported current occupation of respondents form the data base of this study. An accuracy test of such retrospective work and occupation status reporting was conducted by the Census. Highlights of the findings are reported herein.

Scope of the Classification Problem

In order to give perspective to the problem of occupational classification, it is only necessary to note that the base for construction of the 1970 COCS begins with 23,000 occupational titles. Each of these titles is allocated to one of 400+ separate categories, which form the detailed occupation system. In turn, 12 major occupational groups are constructed from the 429 detailed categories. Although there is an average of over 50 titles per each detailed category, there is substantial variance in the number of titles allocated to each respected category. A small number of detailed occupations are so distinct as to require only a few occupation titles. "Proofreaders," for example, require only two separate titles. For the occupation of "accountants," however, 65 titles are allocated. The detailed category with the largest frequency of titles is that of "machine operatives, miscellaneous specified" for which over 10 pages, each three columns wide, with 60 items per column were needed to list its occupation titles.[2]

There are, then, two basic levels of aggregation: occupation titles to detailed categories and detailed categories to major occupation groups. The process by which categories are combined at each level of aggregation certainly leaves considerable room for critique.

The Academic Critique of COCS

Several academics in recent years have expressed concern over the relevance of Census occupation data. Although this concern has several dimensions, the focal point of the academic critique has been the failure of the Census to meet the taxonomic principal of "homogeneity" in defining both the detailed occupations and the more aggregative major groups. The

exact conceptual criteria employed by the Census in construction of the aforementioned occupational levels is not in evidence. As noted by Hodge and Siegel, the "... (detailed) occupational codes are not formed with reference to the similarity in task performed by individual incumbents of specific jobs. Instead, work settings, industrial affiliations, (class of worker) and other factors are used to determine detailed occupational codes."[3] These authors site several examples to support their statement: "farm laborers, wage workers" are distinct from "farm service laborers, self-employed"; "sewers and stitchers, manufacturing" and "dressmakers and seamstresses, except factory" form two distinct titles; "inspectors, public administration" are divorced from their private counterpart group. The variety of attendants are identified in COCS with the institutional setting apparently serving as the criteria for the construction of the different groups. For example, "attendants, physicians, and dentist office" are distinct from "attendants, hospital and other institutions." Thus, the COCS is a multidimensional typology, with, evidently, a variety of criteria serving to demarcate the various detailed occupations.

The lack of underlying conceptual criteria for construction of the Census detailed categories considerably effects the relevance of the data. This is manifest in two forms: within detailed category homogeneity and largeness in size of the "not elsewhere classified" (n.e.c.) categories. Academic critics have complained frequently of "within" category heterogeneity. As noted by Scoville "coffee tasters, gamblers, and phrenologists (are) classed with museum directors." He also noted that bookmakers, brothel keepers are included with bank presidents while

post office truck drivers are viewed as clerical workers rather than a type of "motor vehicle" operator.[4] Hodge and Siegel provide an example of heterogeneity in the treatment of the occupation title of "flight engineer." In the 1960 Census those individuals reporting their occupation as flight engineer were allocated to either of two detailed categories: "engineers, aeronautical" or "mechanics and repairmen, airplane." Those individuals reporting their industry as "transportation equipment, aircraft and parts" were assigned to the former while those employed in the "air transportation" industry were coded as "mechanics and repairmen, airplane." The reviewers further show by comparison of job descriptions in the dictionary of occupation titles that "flight engineers" have many commonalities with the detailed occupation of airplane pilots and navigators.[5] These examples illustrate how the lack of conceptual criteria for category instruction can lead to disparate groupings.

It is not surprising that the greatest problems of "within" group heterogeneity are found in the n.e.c. categories. Many of the detailed n.e.c. categories contain literally hundreds of occupational titles. The situation is confounded not only by the diverse types of work performed which are included in each of these categories, but, also, by the substantial portion of the labor force encompassed in these catch-all codes. Overall, in 1960, about one-third of the experienced civilian labor force were allocated to n.e.c. classifications.[6] There was substantial variation between major occupation groups in importance of the n.e.c. categories. In the "managers, officials, and proprietors, except farm" major group, 83.5% were in n.e.c. categories. For the "craftsmen,

foremen, and kindred worker" group, however, n.e.c. categories accounted for only 14.7%. Scoville has noted that these n.e.c. groups have had interesting growth rates relative to the overall growth of employment. These findings are reported in Table 4.1.

One major problem with occupational classification as currently practiced is that new jobs which arise from the increasing technological character of production are allocated, first to the n.e.c. groups. They do not, in general, fit into currently appropriated detailed categories. Instead, they are hidden in the catch-all n.e.c. categories. An example is the "computer programmers" occupation which was identified in the 1970 COCS. In 1970, this detailed occupation accounted for over 150,000 workers. But, throughout the decade of the 1960's, "computer programmers" were relegated to the "professional, technical and kindred workers, n.e.c." group. The diversity of titles included in the n.e.c. groups, their substantial size, growth properties, and tendency for new and important growth occupations to appear in these catch-all categories severely limits the analytic usefulness of the Census occupation system.

At this juncture, it is important to note another reason for the considerable size for the n.e.c. categories. The n.e.c. categories serve as allocation groups in that individuals who do not report sufficient detail in stating their occupation are coded to an n.e.c. group. Thus, other than the diverse titles included in the n.e.c. categories, these groups have a sizable error component. In large part, this problem stems from the method of collection of occupation statistics by the Census through household surveys. Table 4.2 indicates the seriousness of this problem. These figures were obtained from a Census study cross

Table 4.1

Importance and Growth of "N.E.C." Employment[7]

Social-Economic Group	% in Major N.e.c. Classifications 1960	Percentage Change 1950-1960 "N.e.c."	Whole Group
Professional, technical, etc.	4.3	+256.5	+47.0
Managers, officials, etc.	83.5	+ 4.7	-15.3
Clerical and kindred	31.3	+ 27.4	+33.8
Sales and kindred	80.6	+ 13.1	+16.1
Craftsmen, foremen	14.7	+ 40.0	+11.8
Operatives and kindred	38.8	+ 2.3	+ 6.4
Service workers	19.2	+ 6.1	+25.6
Laborers and kindred	78.0	- 11.1	-22.2
All employment	34.4	+ 8.9	+14.5

Table 4.2

Percentage of Those in ERC Sample Giving the Same Answer in Both Census and Employer Record Check, by Major Social-Economic Group[8]

Professional, technical	89.73
Managers, officials, proprietors	64.11
Clerical and kindred	84.71
Sales and kindred	91.86
Craftsmen, foremen	84.04
Operatives and kindred	86.54
Service workers	85.21
Laborers except farm and mine	54.02
Sample as a whole	83.19

check comparing the household obtained information with that obtained from the employer through a second sample. Both job title and job description information was requested from employers. Statistical reliability of this study is in question since it was evidently based on 15,050 returns. Scoville has shown that for the sample as a whole there was only 83% correspondence between samples. This measure was calculated using the broadest of Census occupation groups, not the detailed categories. "Such a result must shake our faith in the accuracy of the figures given for several hundred detailed occupations."[9]

It has long been recognized by social scientists that an employer base for collection of occupation statistics is more appropriate.

The problem of response error will not likely be improved until a switch is made to such employer based surveys.

In many instances, job information reported to Census takers by individual workers or household representatives is more insufficient than incorrect. An abundance of insufficient detail in the specification of job type would tend to swell the n.e.c. categories. Conceivably, Census takers could solicit greater detail in the reporting of job type through incorporation of additional probing questions. The additional information could be extremely useful in coding of doubtful cases. Aside from reducing the potential for outright errors, in all probability, additional job description probing questions would tend to lessen the effect of the error component in n.e.c. categories.

With respect to the aggregation of detailed occupational categories into the major occupation groups, violation of the principle of homogeneity is even more evident. The academic critique of these major groups takes a more concrete form for it is argued that the conceptual base for aggregation is irrelevant to the research needs of today.

Historically, the Census major occupation groups are extensions of initial attempts to uncover the various strata of society. The present design of COCS major groups is attributed, in a large part, to the work of Alba M. Edwards. His framework of analysis of extension of the works of Cairnes' "non-competing" groups and Hunt's industrial classification schemes of "proprietory class, clerical workers, skilled workers and the laboring class." The following quote from Edwards perhaps best describes the conceptual framework of COCS major groups[10]:

> "... in the analysis of any of the problems that concern workers as people, and not merely as productive machines, as well as in the analysis of social and economic problems generally, there is, and long has been, a real need for statistics showing in summary form an occupational distribution of the nation's labor force--a need for statistics that cut across industry lines and bring together into one occupational homogeneous group all of the workers belonging to the same social-economic class, *with a minor regard to the occupations they pursue or to the particular part of the industrial field in which they work*." (Italics added)

Neither jobs nor occupations form the theoretical basis of the classifications; Edwards' goal was identification of socioeconomic groups.

Critics of Census occupational classification are in broad agreement that the conceptual base of socioeconomic groups has little relevance to social science research questions today. The interest of economists, in particular, have waned from political economy questions of class structure and changes in that structure over time to questions of the technological character of employment, education and training, labor resource flexibility, and the wage structure. The current classification of occupations on the basis of socioeconomic groups simply does not pertain to the present interests of labor economists.

Given the interest of sociologists in the stratification process, they might be expected to be satisfied with the socioeconomic classification base. But this is apparently not the case. Hodge and Siegel note that there has been a "growing conviction of sociologists that a unitary measure of 'socio-economic status' or class is not sufficient to describe a person's location in the social stratification system."[11] Other criteria such as income and education and the manner in which such

factors combine with occupation are important in identifying social stratification. Occupation classes do not correspond with socioeconomic groups.

Given that the conceptual basis for construction of the aggregate classification in COCS is "socioeconomic groups," the question of how uniformly this concept has been employed remains open. It is difficult to visualize "demonstrators," "hucksters and peddlers," and "newsboys" as in the same socioeconomic class as "advertising agency salesmen," "insurance agents," "real estate agents," and "stock and bond salesmen." Yet, all of the above detailed categories are included in the "sales worker" major occupation group. In fact, in all the major occupation groups, there is substantial variation in socioeconomic status.

None believes that the Census has an easy job in the classification of occupations. There is general recognition that the desire for a limited number of categories for analytical purposes is logically opposed to the taxonomic principle of homogeneity within groups. The main problem seems to be the lack of relevant conceptual criteria for the construction of aggregate groups.

Alternative Conceptual Frameworks

Social scientists at the turn of this century sought a model which reflected the various strata of society in order to study changes in the social structure over time. Socioeconomic status was the conceptual tool for construction of the system. Today, interest has shifted to research questions of the technological character of employment, promotion ladders, wage structure, manpower requirements of the education and training, skill prerequisites, and other factors of

economic content of the labor market. "Type of work performed" rather than the principal craft, trade or profession of employment becomes the guiding criterion in construction of a model reflective of the job content of the work force. The dimensions of jobs which are useful in economic analysis center about type of work performed: 1. specific tasks or functions performed; 2. the purpose for which the job is done; 3. the materials, tools, and equipment used; 4. the standard to be met in the working environment; 5. the education and training needed by the worker to perform the job.[12] The concept of "jobs" is clearly a more appropriate conceptual basis of classification for purposes of labor market analysis: "Jobs are both the microeconomic dimension of labor demand and an integral part of the more general framework of analysis."[13]

What are the proper criteria for construction of a classification scheme within the job framework of type of work performed? Cain, Hansen and Weisbrod, in their appeal for a classification scheme reflecting greater economic content, have stated that the system should mirror classifications of relevant homogeneity "in the sense that a high degree of substitutability should exist within each class." The "elasticity of substitution" of jobs in a given class should on the average be higher than the "elasticity of substitution" of jobs in different classes. "Elasticity of substitution" is used in the conventional sense--"as a measure of the technical ease which one input may be substitute for another to obtain a given output."[14] Furthermore, within any given class of workers, the "cross elasticity of supply" among workers in that class should on the average be higher than the "cross elasticity" between workers in that class and those in other classes. "Cross elasticity of

supply" between two job categories is low when the change in remuneration required to induce workers to change jobs is high. The first condition reflects the employer's view and is dependent upon the willingness and ability of workers in a given job type to perform other tasks.[15]

Classificatory criteria identified by Scoville--promotion, transferability, and substitutability--are parallel to those identified by Cain, Hansen and Weisbrod although less technical and, seemingly, easier to apply. Promotion pertains to rungs of the job hierarchy ladder, each step requiring greater skill and ability coupled with increased responsibility, through which the individual worker passes to the upper grades of his relevant group. Transferability reflects the ability of a worker with standardized skills to perform effectively in a range of different jobs. Substitutability reflects the range of persons of given skill attributes who can adequately perform a given job.[16]

There are two major dimensions in Scoville's division of job structure: "job families" and "level of job content." A job family is a class of work performed with a common "principal technical, material, or functional focus." There is a standard "locus of attention" within a given job family. Examples include working with a machine, working with tools, entertaining, and operating a vehicle. Complexity of the job, "skills, ability, and responsibilities required," form the elements of the second dimension of the job structure, i.e., the level of job content. The different levels of job content subdivide the job family.[17]

Scoville has reclassified the detailed categories of the 1950 COCS using job content criteria. He identifies 18 job families each of which is further divided into five content levels. Among production

related jobs, six job families are identified: 1. tools--specialized; 2. tools--non-specialized; 3. machines and equipment--specialized; 4. machines and equipment--non-specialized; 5. inspection; and, 6. vehicle operation. The "tool class" family of blue collar jobs is distinguished from its "machine and equipment" family by the size of capital goods, complexity of operation and number of people associated with the job. Scoville employs subclassifications of specialized and unspecialized in order to distinguish the narrower classes of occupations with specific skill requirements and limited interindustrial applicability from unspecialized types. Workers in specialized jobs, with the attendant higher than average investments in general and specific training, would tend to have narrower ranges of movement. The concept of specialization is logically opposed to the classificatory criteria of substitutability and transferability.

The remaining families identified by Scoville are as follows: farm; sales A (considerable knowledge of product required); sales B (little knowledge of product required); clerical; personal service; entertainment; protection service; education and training; health service; welfare service; administration and organization; and, research and design. The job family convention is immensely more useful than the major occupation groups employed by the Census. It offers more relevant information on economic dimensions of the occupational structure. It has a clearer technological orientation than is found in the Census aggregate categories. It is, thus, a more relevant framework for assessment of labor market research questions of today.

The academic critique of COCS has spanned the full spectrum from conceptual framework of this classification system to the method in which the data is collected. In general, the critique has been leveled at the failure of the COCS to reflect the taxonomic principle of homogeneity both within the detailed category levels and major occupation groups. An alternative conceptual base for construction of summary categories has been proposed. The influence of the academic critique is seen in some of the revisions which were made in the 1970 COCS. It is to those revisions and other Census responses to the academic critique that we now turn.

Census Response to the Academic Critique

The Bureau of the Census has been in the business of tabulating the occupation distribution of the work force since 1820. As any user of Census data who has attempted intercensal comparability will profess, the classification system has been anything but static. Over the last twenty years, for example, the number of detailed categories identified by the Census has more than doubled. The policy of the Census has been to identify new and important jobs which have arisen from the increased technical character of employment. The philosophy of the Census with respect to occupational classification is indicated by the following[18]:

> "Within the limits of our resources we provide the maximum detail of job families. The criterion used to determine the detailed categories is significance--significance in regard to analytic usefulness, policy need, and number of workers represented."

As jobs within the n.e.c. categories increase in significance, new detailed categories are founded.

The "n.e.c." deficiency of the occupational data is recognized by the Census; however, the n.e.c. categories are not viewed simply as "catch-all groups." Stanley Green asserts that these categories have three main elements.[19] The first element is the residual component: Namely, specific job titles which remain after extraction of significant detailed categories. The second element is the generalized code component. Such titles are justified by the fact that many employment situations involve a wide variety of tasks performed. Many people who have held part-time jobs can attest to the necessity for a generalized category. Thinking back on my own employment experience while in undergraduate school, in the course of a single day with one employer I performed the tasks of salesman, typewriter repairman, stock boy, billing clerk, and delivery boy. It is likely that many of the generalized codes in the n.e.c. categories correspond to jobs inhabited by young workers which are notably lacking in specific functions. The third component, which has been previously discussed, is the error component. This component arises from communication problems in describing job functions. This component is related to the generalized code component: Individuals who correctly belong to a non-n.e.c. category but provide only broad descriptions of job type must, of necessity, be allocated to the generalized codes.

In order to improve the reliability and analytic usefulness of occupational data, particularly with respect to the n.e.c. categories, the Census experimented in the mid-1960's with additional probing questions relevant to job description and new conceptual treatment of the n.e.c. categories. In addition to the probing question of "kind of work," respondents were asked, in a special Census of Cleveland, to also

specify "job title" and "priority order of work activities." The additional probing questions were found to be useful not only in reducing the size of the n.e.c. categories but, also, the size of the "not reported group." "Almost all (95%) of these cases formerly assigned to the not reported category could, after examination of the entries to the additional questions be assigned to an occupational group."[20] The error component to the n.e.c. categories was also substantially reduced; overall, by 15% in an experimental pretest. Additional probing questions apparently have a considerable positive effect on the reliability of the data.

The generalized component represents jobs with broad, loosely specified duties. The basic analytic usefulness of the n.e.c. categories, it seems, could be increased through subdivision into specialized and generalized components. Experiments were conducted to test the feasibility of this procedure; both components proved to be significant for all major group n.e.c. categories. The proportions of generalized and specific titles were relatively equal in many of the major n.e.c. categories.[21] Certainly this device of separating specific from general titles greatly increases the analytic usefulness of these occupational groups.

Favorable pretest results indicated significant information gain from incorporation of additional probing questions in Census questionnaires and subdivision of the n.e.c. categories. These steps were, however, only a beginning of the major revision in the 1970 COCS. The goals of this revision were as follows: 1. identification of new and significant categories; 2. reduction in size of large categories; and, 3. improvements

in homogeneity within categories.[22] Occupational information from the Current Population Survey reports was used in the search for new job titles. Each of the job titles contained in the 297 categories of the 1960 COCS was reviewed in a general homogeneity check. In all, 144 new categories were created. Many of these new categories were simply subdivisions of detailed titles from the 1960 COCS. For example, "linemen and servicemen, telegraph, telephone, and power" was divided into three categories: "electric power linemen and cable men"; "telephone installers and repairmen"; and "telephone linemen and splicers." A number of categories were abandoned completely. The 1960 category of "agents, n.e.c.," and "porters" are examples. Several new detailed categories were added, particularly in the computer, health, and other technical fields. The level of detail in the "operative" category was greatly expanded. Twenty-three detailed categories in the 1970 COCS were derived from the 1960 "operatives, n.e.c." group. In addition, this major group was divided into two major groups: "operatives, except transport" and "transport equipment operatives." The latter corresponds, in general, to the vehicle operation job family identified by Scoville.

Indeed, the influence of the job family concept is evident by the many subdivisions of major groups. Examples in the "professional, technical, and kindred worker" category are "computer specialists," "mathematical specialists," "physicians, dentists, and related practitioners," "health technologists and technicians," "engineering and science technicians," and "writers, artists, and entertainers" subgroups. Similarly, the "service worker, except private household" group, was

divided into five job families: "cleaning service workers," "food service workers," "health service workers," "personal service workers," and "protective service workers." Expansion of the job family concept to the other remaining major groups is not as evident. There was an attempt, however, to reflect variations in content of "sales worker" jobs. The 1960 category of "salesmen and sales clerks, n.e.c." was divided into five categories on a basis of industry affiliation. The main thrust of this operation seems to be in accord with Scoville's identification of job families "Sales A" and "Sales B." There seems to be room for expansion of the job family concept particularly through clerical and blue collar forms of employment.

Revisions of the 1970 Census have been substantial in terms of the extent of the review of detailed categories, realignment of titles, creation of new categories, reduction in size of n.e.c. classifications, improved reliability through expansion of probing questions, increase in analytic usefulness of the n.e.c. categories, and expansion of use of the job family concept. The changes incorporated into the 1970 COCS can hardly be regarded as token. The Census seems to be honest and forthright in its attempt to improve the quality of occupational data.

Measurement of Occupational Mobility

There are three prominent conceptual and methodological problems in the measurement of occupational mobility. First, specification of the measure of mobility in terms isomorphic to the true economic meaning is difficult. Second, empirical results are dependent upon the choice of time period. Third, accuracy of occupational mobility measurement is

dependent upon the method of collection of work history information. Each of these problems is discussed below.

The measure of occupational mobility between two categories of employment should have content in the context of economic theory. That theory states that differentials in net economic advantage between types of employment will induce movement of workers in the direction of the more productive pursuits. Such movements are presumed to lessen differentials in net economic advantage between the various types of employment and, therefore, reduce the incentive to change jobs. As the incentives to move diminish, movement between jobs declines and the occupational distribution of the labor force approaches equilibrium. Thus, by the tenets of economic theory, the volume and pattern of occupational mobility is dependent upon the magnitude of differentials in net economic advantage between job types. Presumably, alternation of the structure of rewards will change the volume and direction of manpower flows.

Although it is desirable that the measure of occupational mobility reflect the economic meaning of term, specification of such a measure is difficult. Consider, for example, the Cain, Hansen, and Weisbrod criterion of "cross elasticity of supply." In this concept, the seeds for construction of a mobility measure with economic content are contained. The greater the wage change needed to induce movement from one occupational category to another, "the lower the cross-elasticity of supply, and the more disparate are the two types of work."[23] Yet, Cain, Hansen and Weisbrod provide few, if any, clues about how to empirically implement this concept. As noted by Lebergott in his discussion of the Cain,

Hansen and Weisbrod article, "I would much like to see the authors compute elasticity for even a few pairs of occupational classes so that we could also join in evaluating this novel, potentially very helpful criterion."[24]

Empirical measurement of occupational mobility in the context of economic theory is difficult for a variety of reasons. First, the labor allocation process is an extremely complex process. As noted by Parnes[25]:

> Labor market studies of workers' attitudes and decisions about jobs have, in short, tended to confirm the view that workers, far from being concerned exclusively--or even primarily--with "net economic advantage" have multiple and complex goals; that their "choices" are bounded by considerable degree of ignorance of alternatives; and that the typical worker is "satisficing" rather than a "maximizing" man, contrary to the postulates of economic theory.

Economists are uncertain of the degree of correspondence between net economic advantage and manpower flows. In order to better explain the labor allocation process, economists have expanded their models to include non-wage criteria. But, of course, such an expansion creates measurement problems of its own: Namely, identification of the proper non-wage factors and their relative importance.

Furthermore, opportunity for movement between occupational categories is clearly a necessary if not sufficient condition for actual movement. Many occupational categories are surrounded by impervious walls such that they are somewhat isolated from market influences. Opportunity for movement into such occupational categories is somewhat limited due to institutional control of supply. Under such circumstances, it is likely that the cross elasticity of supply between such categories and

other job types would be extremely low. Yet, it is uncertain whether this low elasticity would be indicative of willingness and ability of workers to perform various tasks, or merely institutional factors surrounding the job type. This notation of "opportunity" also underscores the fact that much reallocation of human resources occurs without corresponding gyrations of the wage structure.

Cain, Hansen and Weisbrod appear well aware of empirical implementation problems in specification of mobility measures which have economic content. For example, in illustrating their classification criteria, they discussed some preliminary findings that "occupational mobility (by several measures) appears greater between the occupational groups of surveyors and civil engineers than between the groups of civil engineers and aeronautical engineers." Thus, they conclude that the large number of "surveyors" would temper a shortage of "civil engineers," but not a shortage of aeronautical engineers. But, in a footnote they add[26]:

> This finding actually refers to observed inter-"occupational" mobility. Strictly speaking, for the illustration to be valid evidence for a point it should be true that an equivalent percentage change in wage rates of surveyors and civil engineers and of aeronautical engineers (or better 'net remuneration') should bring about greater occupational mobility in the former case. The available data on occupational mobility, unfortunately, do not disclose the magnitude of changes in relative wage rates that lead to the actual occupational shifts--*even assuming that the only reason for the shifts was the change in wages*. (Italics added)

Few clues about how to upgrade the economic content of the "several measures" of occupational mobility are provided by Cain, Hansen and Weisbrod.

Labor economists have long been aware of the distinction between observed movement and the economic concept of mobility. Parnes summarizes the distinctions with a tricotomy of "ability, willingness, and actual movement."[27] The "ability" of workers to change from one occupational category to another has meaning only in regard to the specific skill and aptitude requirements of particular jobs. Ability is measured by the transferability of specific skills between jobs. Thus, it is important for analysis of the maximum potential of labor supply flexibility. Measurement of the maximum potential of flexibility would require exact and specific information on both the training of workers and hiring specifications of firms. Problems of measurement, of course, are present since both sets of information will vary over time and with the level of business activity. Ability to move corresponds with the Cain, Hansen and Weisbrod criteria of elasticity of substitution.

"Willingness" of workers to move between jobs constrains the maximum potential for labor supply flexibility as measured by the "ability" to move. In this concept, workers' tastes and preferences for various types of work are taken into account. Using Kerr's terminology, willingness or "propensity" to change jobs is indicative of "latent mobility." As such, propensity to move is in correspondence with the Cain, Hansen and Weisbrod criteria of cross-elasticity of supply. Measurement of mobility in this context is reflective of the specific circumstances under which the movements took place. "Relatively immobile groups may move in large volume, and potentially mobile groups may remain stationary depending upon the circumstances they face."[28] The concept of propensity is simply reflective of the association

between the volume and pattern of occupational mobility and the particular circumstances which induced movement. Therefore, it is directly related to traditional economic theory of resource allocation.

As the ability to move is constrained by willingness to move, willingness is, in turn, constrained by "opportunities" for movement. As noted by Reynolds, "Opportunity must be added to willingness before any actual movement will incur."[29] Students of labor mobility have had to rely on the actual movement of workers in their assessments of labor supply flexibility. In such actual movements, there is, of course, an intermingling of ability, willingness, and opportunity for movement. Transferability of skills, responsiveness of workers to net economic differentials, and growth and contractions of various types of employment are reflected in the actual movement of workers. Ability, willingness, and opportunity operate interactively; thus, it is difficult to separate out the effects of each in examinations of actual movement.

Because of the impossibility of abstracting from circumstances or incentives in order to form a more generalized mobility measure, choice of time period is a major determinate of the empirical results. For example, the conclusions reached on the volume and pattern of labor mobility would be quite different if one were analyzing worker mobility in the early 1930's versus the late 1940's. Labor economists have found substantial variations in the willingness of workers to change jobs as the level of economic activity fluctuates.

Length of the time period for studying mobility is also an important consideration. One would expect not only larger volumes of movement between occupations based on a longer time perspective, but

also, one would expect greater dispersion in movement for any particular occupational category. In the longer time period, individuals have the potential for numerous short distance moves. Of course, there is also the possibility that within the longer time period of analysis an individual can make a series of moves and, yet, return to the occupational category at the end of the time period which he held at the beginning of the time period. Thus, there is probably an understatement of the true extent of flexibility of labor supply as evidenced by actual movement of workers over an extended period of time.

The time period question is essentially dependent upon the purpose of the research. For an analysis of the influence of economic conditions on mobility, it is necessary to have several reference points in time. Similarly, for an analysis of worker motivation, it is probably necessary to have longitudinal data. Although long-term work histories have definite advantages for particular research questions, studies which employ single labor market transactions still have great usefulness: "With respect to the ability and willingness to make job changes of various kinds, single transactions probably have just as great predictive value as lifetime work histories."[30]

Single transactions have served as the data base in a number of the empirical investigations of labor mobility undertaken in the past. Indeed, it is the most common type of data base for study of labor mobility. In general, the term single transaction will be used to signify studies in which the worker's job status at the end of the time period is compared with the same worker's status at the beginning of

the time period, even though it is recognized that some workers may have undertaken a series of shifts within the time period.

One problem which has particularly plagued research on labor mobility is that of reliability of work history information. There is no "W-2" form for employer reporting of the worker's job status. For data on occupational mobility in particular, reliance on personal interviews to obtain work history information is common. The accuracy of such work history information is largely dependent upon the ability of the individual to recall past work status. Some of the problems inherent in the collection of current work status data by the Census were discussed above. Accuracy of these Census procedures was questioned. These problems cannot help but grow when the individual is asked to report historical work status.

In the 1970 Census of Population, individuals were asked to report work status information for April, 1965. If the individual responded that he was working in 1965, either full or part time, further questions were asked as to his business or industry, occupation, and class of worker (Private, Government, self-employed, or unpaid family worker). The Census has attempted to assess the accuracy of this retrospective reporting of workers' status and occupation. Since responses to this question serve as the data base for this investigation, it is pertinent to examine the major conclusions from the investigation.

The instrument for this assessment of reliability was a national sample survey conducted in the summer of 1968. A subsample of respondents from the July, 1963 Current Population Survey (CPS) were re-interviewed in 1968 and asked to report their work related activities five years ago.

No distinction was made between workers and non-workers in the subsampling. Slightly more than 4,000 completed interviews were obtained; approximately 70 percent of these obtained by return mail, the remaining by personal interviews. Results from the interview in the summer of 1968 were compared with those obtained from the July, 1963 CPS records.

At first glance, the results of this reliability study of retrospective reporting are shattering. It was found that only 57% of the total respondents accurately reported both work status and detailed occupation five years ago. One-third of all errors were accounted for by persons who failed to report having worked in the 1963 period. Of course, data on occupation status five years ago was lost for this group. This loss of information was particularly acute for young workers in the age group of 19-29 years. Only 60% of those in this age group who worked in 1963 correctly reported that they were working in their response to the retrospective questions. Twelve percent of those listed as not working in the 1963 CPS reported in 1968 that they were working five years ago. The net effect is, of course, an undercount estimated at 28% for this age group. Accuracy rates for non-workers, older workers, and those in the more skilled occupations groups were considerably higher than the accuracy rates for the counterpart groups. Overall, there was, approximately a ten percent understatement of the work force in 1963 as measured by retrospective work status reporting in the 1968 sample.[31]

Certainly, these test results dictate the necessity of extreme caution in the interpretation of occupational mobility findings derived from the 1970 Census of Population. Problems of ascertainment of current

occupational status of the work force, discussed previously, accentuate the need for conservative interpretation of empirical results. Yet, certain aspects of the Census reliability test seem to dictate a need for caution before acceptance of those findings. First, the sample size employed in this accuracy test is quite small relative to the goals of the study. The small budget for the accuracy test, it appears, was the constraining force in the limitation of sample size. But, foremost, use of the Current Population Survey results as the benchmark for measurement of the accuracy of the retrospective responses is a questionable procedure, to say the least.

The implicit assumption in the test methodology is that the July, 1963 work status information, as reported in the Current Population Survey, is correct. In point of fact, Current Population Survey data are known to have a high degree of response variability: The data are collected through household interview procedures in which the work status of all members in the household is reported by one member of the household, usually the housewife. To view reported work status in the Current Population Survey as an accurate and stable benchmark for analysis of the reliability of retrospective responses is untenable. The benchmark employed was one step removed from the more accurate employer-based surveys.

The reliability test showed that "the accuracy of the retrospective occupation responses, however, was only about 7 to 9 percentage points lower than the accuracy of reporting current occupation in the 1960 Census."[32] Given the inherent problems in household-based reporting

and the response variability of the Current Population Survey, the retrospective responses may not be, in relative terms, too far off the mark.

Conclusion

In this chapter, a number of problems of concept and method inherent in the study of occupational mobility have been reviewed. These problems divide, approximately, into the two categories: classification of occupations and measurement of mobility. With respect to difficulties of the first type, the work of the Bureau of the Census has been discussed and criticisms of that classification scheme were reviewed. The critics have assailed the heterogeneity of the classifications and the relevance of conceptual criteria for major group category construction. Properties of an alternative classification scheme, developed by Scoville, with a technological, as opposed to a social class, orientation were examined. Important revisions of COCS, in light of the academic critic, were presented. Through such revisions, the overall quality of the classification scheme has been improved. A definite trend towards a job family orientation in occupational classification is evident.

In discussion of measurement problems, the distinction between mobility and movement was examined. Actual movement was noted to be an imperfect measure of mobility in the true economic sense of the term. Although economists are desirous of mobility measures which standardize for incentives to move, few advancements in this area have been recorded. An incomplete understanding of worker motivation in occupational movement has hindered the advancement of measurement methodology. As a result, the time period question is of extreme importance; empirical findings

are, more or less, tied to the time period covered: generalizability of the results is hindered. Reliance of mobility studies on retrospective reporting of work status, which are known to have high response variability, greatly attenuates unqualified acceptance of empirical findings. Questions necessarily turn from "whether the numbers are right" to "whether any relevant information can be extracted from the data." Even with sizable measurement error, extraction of a great deal of relevant information from the data is possible.

FOOTNOTES

[1]Parnes, Research on Labor Mobility, p. 14.

[2]U.S. Bureau of the Census, 1970 Census of Population, Classified Index of Occupations and Industries (Washington, D.C.: U.S. Government Printing Office, 1970.

[3]Robert W. Hodge and Paul M. Siegel, "The Classification of Occupations: Some Problems of Sociological Interpretation," in American Statistical Association, Proceedings of the Social Statistics Section, 1966 (Washington, D.C.: n.p., 1966), p. 178.

[4]James G. Scoville, "Making Occupational Statistics More Relevant," in American Statistical Association, Proceedings of the Business and Economics Statistics Section, 1965 (Washington, D.C.: n.p., 1965), p. 318.

[5]Hodge and Siegel, "Classification," p. 181.

[6]Scoville, "Making Occupational Statistics More Relevant," p. 318.

[7]Ibid., p. 318, Table 1.

[8]Ibid., p. 319, Table 2.

[9]Ibid.

[10]Alba M. Edwards, Comparative Occupational Statistics for the United States, 1870-1940 (Washington, D.C.: U.S. Bureau of the Census, 1943), p. 175.

[11]Hodge and Siegel, "Classification," p. 183.

[12]G. Alexandrin, "Notes on Occupational Classification," Quarterly Review of Industrial Relations 21 (1966): 531.

[13]Scoville, "Making Occupational Statistics More Relevant," p. 317.

[14]Cain, Hansen, and Weisbrod, "Classification," p. 201.

[15]Ibid.

[16]Scoville, Job Content, pp. 15-17.

[17]Ibid., p. 12.

[18]Stanley Greene, "Some Recent Decennial Census Occupational Experimental Work," in American Statistical Association, Proceedings of the Social Statistics Section, 1966 (Washington, D.C.: n.p., 1966), p. 194.

[19]Ibid.

[20]Ibid.

[21]Ibid., p. 198.

[22]For a more detailed examination of changes in Census classification conventions, consult: U.S. Bureau of the Census, 1970 Occupation and Industry Classification Systems in Terms of Their 1960 Occupation and Industry Elements, Technical Paper No. 26 (Washington, D.C.: U.S. Government Printing Office, 1972).

[23]Cain, Hansen, and Weisbrod, "Classification," p. 201.

[24]Stanley Lebergott, "Discussion," in American Statistical Association, Proceedings of the Social Statistics Section, 1966 (Washington, D.C.: n.p., 1966), p. 208.

[25]Herbert S. Parnes, "The Labor Force and Labor Markets," in Employment Relations Research, eds. H. G. Heneman, et al. (New York: Harper and Brothers, 1960), p. 30.

[26]Cain, Hansen, and Weisbrod, "Classification," p. 201.

[27]Parnes, Research on Labor Mobility, p. 13.

[28]Clark Kerr, "Migration to the Seattle Labor Market Area, 1940-1942," University of Washington Publications in the Social Sciences (August 1942), n. on p. 151.

[29]Reynolds, Structure of Labor Markets, p. 240.

[30]Parnes, Research on Labor Mobility, p. 41.

[31]U.S. Bureau of the Census, Economic Statistics Branch, Population Division, "Accuracy of Retrospectively Reporting Work Status and Occupation Five Years Ago" (February 1970), Unpublished Report E15 No. 3.

[32]Ibid., p. 2.

CHAPTER V

EMPIRICAL METHODOLOGY

An exact modeling of the research question is paramount. Use of over three-hundred occupational categories results in a mobility matrix with more than 90,000 cells. A matrix of such intractable proportions is difficult to represent physically, let alone visually analyze for patterns of interrelationship. In order to unfold the imbedded structure in this large of a data matrix, a methodology which is both consistent and systematic is needed: It must have a consistent theoretical base and it must be capable of systematically searching a very large data set.

Several types of empirical analyses were reviewed in the search for appropriate methodology including Regression, Factor, and Discriminant. Such standard multivariate techniques were, in general, found to be inappropriate to the task. At first, the "Q-type" method of factor analysis seemed promising, but the literature on factor analytic methods contains controversy over its use.[1]

Empirical techniques in Biology and Psychology proved useful. In Biology, there have been recent advances in the "numerical taxonomy" field.[2] Various attributes of physical specimens are measured: The measured values are combined to produce a single numerical index of "affinity" between all specimen pairs. Based on the derived measures of similarity, the specimens are clustered into phenoms. Such a methodology enables the researcher to use more information in the classification of species than would otherwise be possible. In Psychology, such techniques (many of which are classified under the general title of "multidimensional

scaling") are important in the study of interrelationships among objects on the basis of "perceived" similarities. Knowledge gained through study of biological and psychological techniques was useful in development of the methodology discussed below.

There are three major divisions to the empirical methodology of this investigation. The first is the theoretical mobility model. This methodology is concerned with organization of the occupational mobility data in a reasonable, intuitive framework. The second is the distance model formulation which is used in the construction of an inverse affinity measure between each pair of occupations through comparison of mobility distributions. The third division of methodology is cluster analysis. This methodology is used to group occupations on the basis of the derived affinity measures. Each of these methodologies is discussed in detail below. The sequential nature of these methods will become apparent.

Two Theoretical Mobility Models

There are essentially two ways in which the process of occupational mobility can be viewed: distribution of "out-flow" from an occupational category, or distribution of "in-flow" into an occupational category. The first type will be referred to as the "egressive" model; the second, the "ingressive" model. Consider the matrix in Figure 5.1. The rows and columns of this matrix represent occupations, except for the last row and column which we will assume to be "non-work" status. As a result, the coefficient "n_{ij}" shows the number of individuals, in the sample, who changed from occupation "i" to occupation "j," within a specified period of time. Note that in reading across a row (n_{i1}, n_{i2}, n_{i3}, ...), we have the distribution of movements "out-of" a given category, the "egressive"

Figure 5.1

The Count Matrix (N) for M-Occupations

$$N = [n_{ij}] = \begin{bmatrix} n_{11} & n_{12} & n_{13} & \cdot & \cdot & \cdot & n_{1j} & \cdot & \cdot & \cdot & n_{1m} \\ n_{21} & n_{22} & n_{23} & \cdot & \cdot & \cdot & n_{2j} & \cdot & \cdot & \cdot & n_{2m} \\ n_{31} & n_{32} & n_{33} & \cdot & \cdot & \cdot & n_{3j} & \cdot & \cdot & \cdot & n_{3m} \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ n_{i1} & n_{i2} & n_{i3} & \cdot & \cdot & \cdot & n_{ij} & \cdot & \cdot & \cdot & n_{im} \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ \cdot & \cdot & \cdot & & & & \cdot & & & & \cdot \\ n_{m1} & n_{m2} & n_{m3} & \cdot & \cdot & \cdot & n_{m4} & & & & n_{mm} \end{bmatrix}$$

distribution. Reading down a column (n_{1j}, n_{2j}, n_{3j}, ...), the source of recruits "into" a given category is provided; thus, the "ingressive" distribution.

The rows are also indicative of job or non-work status in the initial time period; the columns, the terminal time period. If the sample covered the entire population, the occupational distribution of the work force in the initial time period could be obtained by summing all columns values of each row into a single column vector.[3] Similarly, the occupational distribution for the terminal time period could be obtained through a row summation of each column.

In the two theoretical models, there is need of standardization for purposes of intercategory comparison. To state that two occupations are similar because each supplied an equal number of individuals to a third category, for example, is nonsense, unless the two occupations happen, in the initial time period, to have the same number of workers. The quickest means for such standardization is conversion to percentage distributions: Yet, this leads to other problems.

There are a number of possibilities for percentage expression of both the egressive and ingressive distributions. Since the subject of the study is occupational mobility, certainly one would not want to exclude the off-diagonal elements in the formation of the base. But, four meaningful alternatives are available:

1. Include diagonal, Include non-work status,
2. Include diagonal, Exclude non-work status,
3. Exclude diagonal, Include non-work status, or
4. Exclude diagonal, Exclude non-work status.

In the first alternative, all elements of each row (column) are summed; each element is then divided by that sum. The egressive (ingressive) distribution would, then, be row (column) stochastic in that all row (column) sums would be equal to unity. Since the first alternative uses all available information, it can be said to have a "continuous population base." Similarly, since movement to (from) non-work status is excluded in the second alternative, the resulting distribution might be said to form a "continuous working population" base.[4] The third alternative would include job or work status changers only; the fourth, occupation

changers only. All alternatives are reasonable in that they represent differing levels of "elevation."[5] Yet, due to resource constraints, some definite choices have to be made.

I decided to choose one alternative for each of the two models. For the egressive model I chose the second alternative or continuous working population base. The egressive model, which will be referred to as the "probability transition matrix" or P-matrix, is composed of elements constructed as follows:

$p_{ij} = n_{ij}/\sum_j n_{ij}$, $(j = 1, 2, \ldots, m)$, where "m" is the number of occupations.

Diagonal elements of the P-matrix (p_{ii}'s) show the proportion of the continuous working population which remained in the given occupation category; these elements will be referred to as "retention rates."

Representation of the egressive distribution in the method outlined above is not a substantial departure from past analyses of occupational mobility. It has the advantage that individuals who are working in both time periods have, in general, stronger attachments to market work as opposed to those who fluctuate in labor force participation. This formulation, then, emphasizes interchange of market functions: Substitutability of market forms of employment, not market work for non-market activities. Through inclusion of the main diagonal, the tendency for self-supply (the retention rate) for a particular occupational category can be analyzed. Examination of the off-diagonal elements in terms of a base of occupation changers only, in which both main diagonal elements and movements to non-work status would be ignored, is an interesting formulation. Yet, such a formulation would ignore the

tendency for the distinct and attractive occupations to have higher retention rates. The retention rate, as will be seen, plays a special role in comparative analysis of egressive distributions.

For the ingressive model, the third alternative, status changers only, was selected. All column off-diagonal elements, including entrance from non-work status, are summed and each column element is divided by the resulting column sum. The diagonal is assumed equal to zero. This ingressive model will be called the "recruitment dependence" matrix or R-matrix. Symbolically, the elements of R are computed as follows:

$$r_{ij} = n_{ij}/\sum_i n_{ij}, \quad (i = 1, 2, \ldots, m + 1) \quad (i \neq j)$$

$$r_{ij} = 0, \; (i = j)$$

The primary reason for selection of this formulation is its interesting interpretation: r_{ij} shows the percent of recruits to occupation "j" supplied by occupation "i." Thus, the recruitment dependence coefficient measures the dependency of a given occupation category on alternative job types--or non-work status for that matter--as a supply source. Non-work status is included since this is an important source of supply for many occupation types.

Occupations at the top of the career hierarchy would be expected to depend heavily on occupational mobility, as opposed to direct movement from non-work status, for supply. Yet, occupations with high formal education requirements would tend to draw heavily from non-work status. So would initial and trial type vocations. The apparent similarity, dependence on non-work status, is spurious and can be corrected readily through division of the non-work status category by education levels.

Four such levels seem appropriate: (1) pre-high school; (2) high school; (3) college 1-3 years; and (4) college 4 or more years. Professional occupations will rely heavily on recruitment from non-work status, but such recruits will be of a very high quality.

In summary, two theoretical mobility models have been identified in this section, each of which can be expressed in a variety of standardized forms. One such form was chosen for each theoretical model. An interpretation of resulting coefficients and justification of each selection was given. Each model provides a basis for making comparative judgments. For example, with the R-matrix, two occupation categories could be compared on the basis of recruitment dependence on a third occupation type (r_{ki}, r_{kj}). But, essentially, we have at hand too much information of this type: There are (m - 2) such possible comparisons for the egressive model, where m is the number of occupations. A model is necessary to present all such information in a compact form.

The Distance Model

The model chosen for measurement of agreement of egressive and ingressive distributions between all occupational pairs is a distance model. Such a model is based upon the notion of a metric space in which the measure of distance has four important properties. First, the distance between an object and itself is identical to zero. Second, the distance between an object and any other object in the metric space is greater than zero. Third, distance is symmetric, i.e., independent of the direction of measurement. Fourth, the direct distance between any two objects in the metric space is less than or equal to the sum of the indirect distance through a third object. This

last property is known as the "triangle inequality." Using the notation "d" to signify the distance function for objects "i, j, and k" defined in the metric space, the above four properties can be restated as follows:

(1) $d_{ii} = 0$

(2) $d_{ij} > 0$

(3) $d_{ij} = d_{ji}$

(4) $d_{ij} \leq d_{ik} + d_{kj}$

The generalized form of the distance function is as follows:

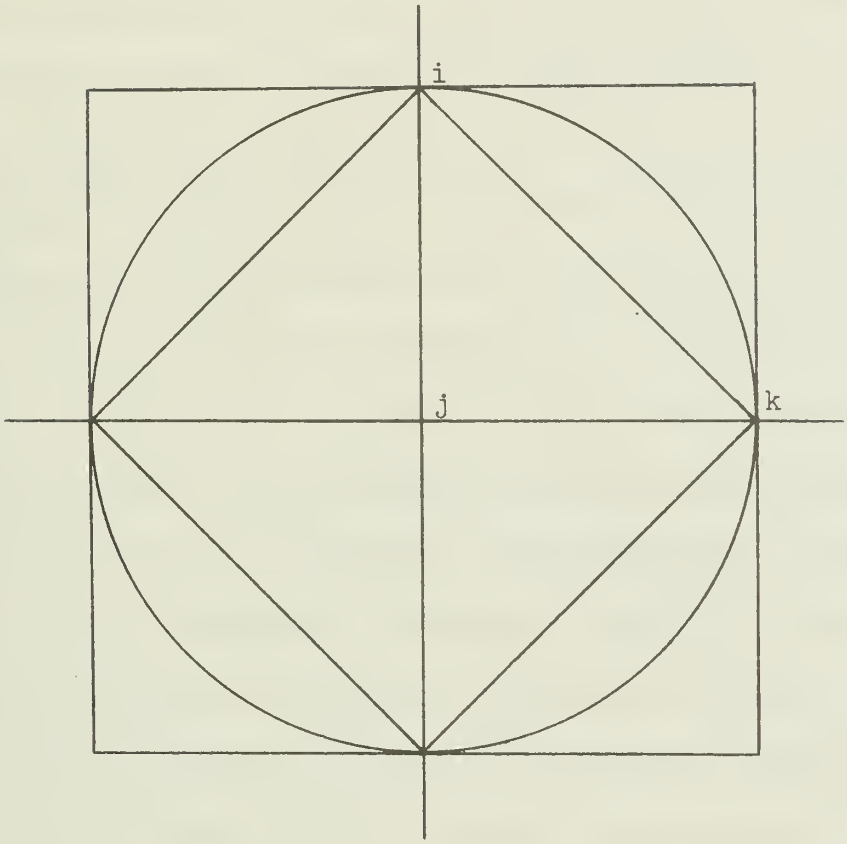
$$d_{ij} = [\sum_k (|x_{ik} - x_{jk}|)^p]^{1/p},$$

where x_{ik} is the projection of object-point "i" on measurement axis "k." In this form, the distance function is known as the "Minkowski" or "power metric." It is required that the value of "p" be greater than or equal to "1.0" in order to satisfy the triangle inequality. The most common values of the only parameter in this model are p = 1.0 and p = 2.0. The former case is known as the "city-block" metric; the latter, the well-known "Euclidean" formulation. City-block distance (sum of the absolute value of each component difference) assigns equal weight to each dimensional difference. The formulation of Euclidean distance (square-root of the sum of squared component differences), however, in effect "double weights" each component difference. As "p" approaches infinity, only the largest component difference contributes to distance.[6]

Variations in the magnitude of "p" not only affect the implied weights given to each component difference: Such changes also result in variation of the "isosimilarity contour." To illustrate the notion of isosimilarity contour, consider the diagram in Figure 5.2 below. In

Figure 5.2[7]

Comparative Isosimilarity Contours



this figure, point "j" is the point of reference. Points "i" and "k" are hypothetically defined as of unit distance from point "j." Thus, by all possible Minkowski methods, points "i" and "k" are of equal similarity to point "j." Given this hypothetical example, the question is what other points would be of equal similarity to "j" given different values of "p"? The set of all such points defines the isosimilarity contour with respect to "j." For the city-block metric, all points unit distance from point "j" would lie on the diamond-shaped contour around "j." With the Euclidean metric, the isosimilarity contour is defined by unit radius around point "j," the circumference of a circle of unit radius. As the

"p" coefficient in the Minkowski's formulation approaches infinity, the isosimilarity contour approaches the square: The largest dimensional difference dominates the metric.

This hypothetical example illustrates an important feature of the Euclidean distance formulation--invariance under rotation. Any equal-directional rotation of the axes leaves unchanged the isosimilarity contour of reference point "j." Such cannot be said for the other possible values of "p." In fact, a 45° rotation would change the city-block metric into the "supremum" metric of "p" = infinity. This characteristic of Euclidean distance is extremely important in metric multidimensional scaling where the axes are unknown. In truth, the city-block metric "implies a fixed, unique set of axes for the space."[9] Yet, this assumption, it seems, is easily met in application of the distance model to the research question at hand--the axes are the occupation categories. Invariance under rotation is, then, not an important consideration in selection of the power value.

Primary reliance will be placed on the city-block metric for both egressive and ingressive models because of certain theoretical "necessities." With slight modification of the P and R matrices, the Euclidean formulation is useful in the unfolding of certain interrelationships in the data matrices.

Primary Metric Model for P-Matrix

The city-block metric, when coupled with the row (column) stochastic property of the egressive (ingressive) model, enables ascertainment of the theoretical limits of the distance value. Consider the city-block method applied to the P-matrix: $Pd_{ij}^{cb} = \sum_{k} (|p_{ik} - p_{jk}|)$.

Since each row of the P-matrix sums to unity, the maximum distance between any two occupational categories is equal to "2.0." Of course, the minimum distance is zero, but this is not a probable value. The city-block distance metric can be expanded as follows:

$$Pd_{ij}^{cb} = |p_{ii} - p_{ij}| + |p_{ij} - p_{jj}| + \sum_{k \neq i,j} (|p_{ik} - p_{jk}|).$$

Thus, $Pd_{ij}^{cb} = 0$ only if the probability of movement from occupation "j" to occupation "i" is equal to the retention rate of i^{th} category, the probability of movement from occupation "i" to occupation "j" is equal to the retention rate of the latter, and there is complete correspondence in coefficient size for all other "m - 2" categories. Although "zero" is the theoretical lower bound, it is not a probable value.

In fact, there is a tendency for the retention rate to create a "base" distance between two occupation categories. This can be seen by a further restatement of the city-block distance function:

$$Pd_{ij}^{cb} = (p_{ii} + p_{jj}) - (p_{ij} + p_{ji}) + \sum_{k \neq i,j} (|p_{ik} - p_{jk}|).$$

The first term, in parentheses, is the sum of the retention rates; the second, the sum of the "mutual interchange" (MI) coefficients. The base distance is defined as the sum of the retention rates: The distance obtained when MI coefficients are both zero and when there is complete non-agreement on the remaining axes ($p_{ik} > 0$ when $p_{jk} = 0$ and vice versa). Now the lower bound can be more precisely defined as the sum of the retention rates minus the sum of the MI coefficients, since the third term is at a minimum equal to zero. High retention rates imply large base distances; thus, a high retention rate tends to "build a wall" around the relevant occupation.

In truth, occupations with low retention rates will have smaller "base" distances, but also greater potential growth of the third term in the above expression. Yet, of course, two occupations with low retention rates have the greatest potential for a small distance value while two occupations, both with high retention rates, have the least.

Primary Metric Model for R-Matrix

The city-block metric will be applied to the "column stochastic" R-matrix. Most of the theory discussed above with respect to Pd_{ij}^{cb} is transferable to this application with one major exception: The MI coefficients cannot be included in the distance formulation since the diagonal elements are defined as "zero" in the R-matrix. Thus, positive MI coefficients would actually operate to increase, instead of decrease, the distance between two occupation categories. Certainly this is an untenable result.

Since a bulk of the information for the R-matrix is found in the "entrance from non-work status" category with its four educational divisions, in practice, little information is excluded by dropping the MI coefficients. Thus, for the ingressive model, the city-block metric will have the following specification:

$$RD_{ij}^{cb} = \sum_{k \neq i,j} \left(\left| r_{ki} - r_{kj} \right| \right).$$

Theoretical range of the distance value is between zero and two.

Supplementary Formulations

One major problem in each of the applications discussed above with respect to the P-matrix is that the base distance varies with the

size of the retention rates. Actually, I consider this a "feature" rather than a "failing." But, it is, nonetheless, true that the Pd^{cb} values, while bounded from above, have, in effect, variable lower bounds, depending on retention rates.

Identical base distances can be obtained through replacement of the main diagonal elements by a constant. The value "1.0" seems a logical choice for two reasons: First, all off-diagonal elements are, by definition, less than or equal to 1.0; thus, an MI coefficient cannot be larger than its comparative diagonal value. Second, it provides an intuitive benchmark: The projection of an occupation onto its own axis becomes the identity projection. Specification of the distance function is, then, as follows:

$$P_I d_{ij}^{cb} = \sum_k \left(\left| p_{ik} - p_{jk} \right| \right),$$

where the "I" subscript signifies that the diagonal was replaced by "ones."

Use of the identity projection on the R-matrix seems to produce the best of both worlds: equal base distance of 2.0 and theoretical upper bounds of 4.0. The formulation is as follows:

$$R_I d_{ij}^{cb} = \sum_k \left(\left| r_{ki} - r_{kj} \right| \right).$$

Now, the MI coefficients can be included.

The Euclidean formulation is utilized for one specific purpose, that is to highlight the MI coefficients. Recall that the Euclidean measure weights each component difference by the size of that difference. In addition, since all off-diagonal elements are between zero and one, small component differences contribute minimally to the distance function.

A difference of ".2" adds only ".04" while a difference of ".9" adds ".81" to the distance value before the square-root is taken. Thus, the large component differences are in relative control of the function. Through use of the identity projection, the MI coefficients can be insured a large role in the distance function.

In fact, through manipulation of the constant term in the diagonal of the P or R matrices, the importance of the MI coefficients can be increased or decreased. Consider the following theoretical argument analyzed in terms of the P-matrix, but equally applicable to the R-matrix:

I. Initial distance squared is defined with zeros in the main diagonal:

$$P_0 d_{ij}^2 = (0 - p_{ji})^2 + (p_{ij} - 0)^2 + K_{ij}, \text{ where}$$

$$K_{ij} = \sum_{k \neq i,j} (p_{ik} - p_{jk})^2$$

II. Distance squared with constant value "C" in main diagonal is as follows:

$$P_C d_{ij}^2 = (C - p_{ji})^2 + (p_{ij} - C)^2 + K_{ij}$$

III. Solve for $P_C d_{ij}^2$ in terms of $P_0 d_{ij}^2$:

$$P_C d_{ij}^2 = P_0 d_{ij}^2 + 2C\ [C - (p_{ij} + p_{ji})]$$

IV. Differentiate $P_C d_{ij}^2$ with respect to "C" and solve for the minimum value:

$$\frac{\Delta P_C d_{ij}^2}{\Delta C} = 2\ [2C - (p_{ij} + p_{ji})] = 0$$

Thus, $P_C d_{ij}^2$ = minimum when $C = (p_{ij} + p_{ji})/2$.

Several conclusions can be drawn from the above. From part III, the distance value squared is a function of the initial distance value, $_{P_0}d^2_{ij}$; the constant value in the diagonal, C; and, the sum of the MI coefficients. Also, from III, the distance value returns to its initial state when "C" is equal to the sum of MI coefficients. From IV, the growth rate in the distance value, due to an increment in "C," is dependent upon the sum of the MI coefficients; the distance function with the largest sum $(p_{ij} + p_{ji})$ reaches its minimum value last and grows at the slowest rate. From the above, it can be reasoned that there exists a value of "C" such that the rank order of the distances is dependent only upon the rank order of the sum of MI coefficients, except in cases of ties in which the growth rates are identical: The initial ordering would, in these particular instances, remain unchanged with increments in "C."

The example below is offered in proof of the assertion that the rank order of the distances is eventually governed solely on the magnitude of the sum of MI coefficients. Assume:

(1) $(p_{ij} + p_{ji}) > (p_{lm} + p_{ml})$ and,

(2) $_{P_0}d^2_{ij} > {}_{P_0}d^2_{lm}$.

But, since:

$$_{P_C}d^2_{ij} = {}_{P_0}d^2_{ij} + 2C\,[C - (p_{ij} + p_{ji})] \text{ and,}$$

$$_{P_C}d^2_{lm} = {}_{P_0}d^2_{lm} + 2C\,[C - (p_{lm} + p_{ml})],$$

then, $_{P_C}d^2_{ij} > {}_{P_C}d^2_{lm}$ if and only if:

$$_{P_0}d^2_{ij} + 2C\,[C - (p_{ij} + p_{ji})] > {}_{P_0}d^2_{lm} + 2C\,[C - (p_{lm} + p_{ml})],$$

or:

$$\frac{P_0 d_{ij}^2 - P_0 d_{lm}^2}{2[(p_{ij} + p_{ji}) - (p_{lm} + p_{ml})]} > C$$

Thus, there exists a "C" such that $P_C d_{ij}^2 < P_C d_{lm}^2$. Given a sufficiently large value of "C," the occupation pair with the largest sum of MI coefficients would have the lowest distance value; the second largest sum, the next to lowest distance value; and so on.

Rank order of the distance coefficients is, in general, unaffected by the value of "C" for the city-block metric, provided the value of "C" is greater than the largest off-diagonal element. The result of an increment in "C" is merely to increase each distance by two times that increment. Thus, the rank order of all distances remains unchanged. This is true, however, only if $C < \max(p_{ij})$: Otherwise, at least one distance is decreasing due to a small increment in "C."

The purpose of this theoretical discussion of the effect of changes in "C" on rank order relations among the distance measures was not to argue that the sum of MI coefficients should be the guiding criteria for ordering the distances. Quite the contrary, I sought only to defend an earlier contention that the Euclidean metric, as applied to P and R matrices with constant values in the main diagonal, tends to highlight the "mutual interchange" coefficients. In all probability, a very large "C" would be required in order for the rank order of the distances to approach stability. As indicated by the last equation of the previous set, a large difference in initial distances and near equality of MI coefficient sums would necessitate a very large "C." It seems senseless to destroy the information in the initial distances for a small gain in order.

Although I have yet to develop a criterion for optimally choosing "C," the choice of unity seems sound. For example, if the largest MI coefficient sum if ".5," the distance corresponding to this sum reaches a minimum at C = .25 and returns to its initial value at C = .5. A value of 1.0 for the diagonal certainly allows additional unfolding of important MI coefficients. In fact, all initial distances with differences less than <u>twice</u> the difference in MI coefficients sums will have a consistent rank order, according to the theory.

Two values for "C" will be used in both the P and R matrices: The maximum off-diagonal entry of each matrix and, of course, the identity projection. Use of two values will enable a sensitivity check with respect to the cluster analysis methodology. Specification of the four distance models is as follows (note: "X" signifies maximum off-diagonal value):

(1) $P_I d^e_{ij} = [\sum_k (p_{ik} - p_{jk})^2]^{1/2}$,

(2) $P_X d^e_{ij} = [\sum_k (p_{ik} - p_{jk})^2]^{1/2}$,

(3) $R_I d^e_{ij} = [\sum_k (r_{ki} - r_{kj})^2]^{1/2}$, and,

(4) $R_X d^e_{ij} = [\sum_k (r_{ki} - r_{kj})^2]^{1/2}$.

Thus, in total, there are four distance formulations for both the city-block and Euclidean metrics.

<u>Cluster Analysis Methodology</u>

In the distance models, the occupations are viewed as points in a multidimensional metric space with each mobility coefficient providing the projection of a given occupation point on a given occupation axis.

Thus, P_{ij} is the projection of occupation "i" onto axis "j." These numerous occupation points may tend to naturally cluster into relatively homogeneous groups in the multidimensional space. The purpose of cluster analysis is to delineate such groups. Each of the distance models provides m(m-1)/2 such intercategory comparisons: With 304 occupations, there are then 46,056 such measures. This massive amount of information for each of the distance models necessitates use of a methodology capable of identifying the underlying pattern or structure which is literally hidden in these empirical data matrices. Such identification is not evident from mere inspection alone. What is sought is a method for optimally classifying the occupations into homogeneous groups on the basis of these empirical measures of dissimilarity. The problem is basically a cluster analysis problem. For example, with respect to analysis of the P-matrix, it is desired that occupations that have relatively similar egressive distributions, as defined by low interpoint distances, to cluster together. In contrast, identification of occupations or groups of occupations which have distinct egressive distributions is desired. Much information is gained by examination of occupations which do not cluster with others.

A method of analysis which has close correspondence to the problems at hand is that of Johnson's Hierarchical Cluster Analysis (H.C.A.). The Johnson method has four important features. First, his method accepts any m(m-1)/2 measures of similarity (or dissimilarity) between m-objects as input. In contrast to many of the previous methods of cluster analysis, there is no restriction that the objects be defined in a metric Euclidean space. Second, the scheme for clustering is

hierarchical. Third, the cluster result is invariant under monotonic transformations of the similarity data. Fourth, the resulting clusters have precise mathematical meanings.

The clustering algorithm as developed by Johnson is "hierarchical" in the sense that for any "m" objects, there are "m-1" cluster representations. At the first cluster level, two objects are combined. At the second cluster level, there are two possibilities: an object can join the already existing cluster, or two other objects can form a distinct cluster. For the third and remaining cluster levels, there is the additional possibility of two clusters joining together. Finally, at the last cluster level all objects appear in the same cluster. The problem is, of course, how to proceed from the weak clustering, in which all objects are distinct, to the strong clustering, in which all objects are together.

Any transformation of the similarity values which preserves their rank order will not change the cluster result in Johnson's method. Such a transformation is known as a "monotonic" transformation. One such monotonic transformation of the similarity data is, of course, transformation to rank order: The rank ordering of the proximity values provides an identical cluster representation to that obtained with the original interpoint distances. Thus, the Johnson H.C.A. method imposes minimal requirements on the data. Confidence in the data up to rank order is sufficient.

Two hierarchical cluster methods are presented by Johnson: the maximum method and the minimum method. Each of these methods of clustering have strong intuitive meanings. Two terms will be used

interchangeably with the maximum and minimum methods: diameter method and connectedness method, respectively. These terms are isomorphic to the meanings of the clusters. Defining the diameter of a cluster as the largest intra-cluster distance between the objects in the cluster, "the maximum method attempts at each stage to minimize the diameter of the clusters."[10] In essence, for an object to join a cluster, that object must be minimally related to all the objects in that cluster.

The connectedness method differs: An object must have close proximity to only one member of the cluster in order to qualify for admittance. In this method, then, clusters are formed which are optimally connected.

The "value of a cluster" for the diameter method is equal to the largest interpoint distance between all possible object pairs within the cluster. For the connectedness method, the value of a cluster can be described as the distance between the most isolated object in the cluster and its closest neighbor. Consequently, Johnson's diameter method can be said to represent a complete linkage; the connectedness method, a single linkage.

The algorithmic procedure for construction of the hierarchical cluster representation can be described in terms of two processes. In the first step, the two closest objects are combined to form a cluster. In the second step, the dissimilarities matrix is redefined in the sense that the distance between all objects and the newly-formed cluster is recalculated. In the maximum method, the distance between the cluster and all other, as yet, unclustered items is set equal to the maximum distance between the two cluster objects. For example, if objects "x"

and "y" cluster at the first level (signified as "C_1"), the distance between "C_1" and object "z" is defined as the larger of d_{xz} or d_{yz}. In the minimum method, the reverse is the case. As a result of this redefinition, the dissimilarities matrix is reduced in size to "m-1" by "m-1." The smallest value in the reduced dissimilarities matrix is then sought. In other words, the procedure reverts back to step one. This interactive process continues until the strong cluster representation is obtained.

Gruvaeus and Wainer have proposed an addition to Johnson's H.C.A. which results in a unique ordering procedure (except for reflection) of the cluster representation.[11] One problem encountered in Johnson's specification of the H.C.A. algorithm is that permutation of rows and columns of the original dissimilarities matrix will, in general, result in a different cluster representation. This is not to say that the objects within a cluster at any given value of cluster are not identical, but only that the ordering of the objects within that cluster can vary substantially. A simple ordering rule alleviates this problem, and, in general, conveys more information. As pointed out above, essentially three things can happen in all cluster levels above the second level: (1) two objects can form a cluster; (2) an object can join an already existing cluster; or (3) two existing clusters can combine.

In the first instance, Gruvaeus and Wainer arbitrarily order the pairs. But, in all instances in which an object joins an already existing cluster, the object is placed adjacent to the object on the outside of the already existing cluster with which it is closest. When clusters of two or more objects each are combined, the object on the end

of the first cluster is compared with both endpoint objects of the second. Then, the endpoint objects of greatest proximity are placed adjacent to each other. For an example of an object joinging a cluster case, assume that at the next cluster level, object "z" is to join the cluster defined by objects "x" and "y." If d_{zx} is less than or equal to d_{zy}, then "z" is placed adjacent to "x" and the cluster becomes (z, x, y). Four distance comparisons are necessary in the case where clusters are combined. Assume that the endpoints of the first to-be-combined cluster are "a" and "b," while for the second to-be-combined cluster, the endpoints are "y" and "z." The minimum value of distance from the set d_{ay}, d_{az}, d_{by}, and d_{bz} is sought. If, for example, the minimal distance in this set is d_{by}, these objects become adjacent in the new cluster representation (a, b, y, z). Through the Gruvaeus and Wainer ordering method, more information from the dissimilarities matrix is employed. The cluster order is unique. Their addition to Johnson's methodology is particularly useful in this study where cluster order is crucial.

Theoretically, the diameter method is the most appropriate for this investigation. The research objective is to delineate occupation groups such that <u>all</u> occupations within each group, given an effectiveness level, are interrelated through labor mobility. For the diameter method, each pair of objects within any given cluster set, which has as its effectiveness measure a specified "value of cluster," is proximally related by a distance value which is less than or equal to the value of cluster. In other words, the value of cluster is the maximum intra-cluster distance between all object pairs within a cluster set. An object is not admitted into a cluster set unless it is minimally related

to all objects within that set. The clusters are, then, optimally compact. Furthermore, the first cluster value is the minimum distance in the dissimilarities matrix (as is the case with the connectedness method) while the "strong" cluster value, the value at which all objects appear in the same cluster, is the maximum interobject distance in all m(m-1)/2 possible object pairs.

In contrast, the "admittance" criterion for the connectedness method is less strict: An object must be minimally related to only one object in the cluster set. The value of cluster for this method is the distance between the most isolated object and its closest neighbor. The resulting clusters are chain-like. As with any chain, the pairwise linkages may be strong; but, overall, the linkages between objects at the endpoints of the chain are lengthy and weak. Interpretability is hampered since the maximum intra-cluster distance can--and in many instances will--exceed the value of cluster.

Due to correspondence with the research question of this investigation, the complete linkage provided by the diameter method is seen as superior to the connectedness method. It is noteworthy that users of the Johnson clustering method have displayed a preference for the diameter method.[12] Even Johnson appears to prefer this method although he states that for particular applications the alternative may be preferable.[13] Although there is, in all probability, information to be garnered through employment of the connectedness method, the fact that we have eight dissimilarity matrices to analyze necessarily limits the scope of this research to the most appropriate technique.

A Complete Cluster Analysis Example

The Blau and Duncan mobility matrix of "first job" to "respondent's occupation in 1962," reported earlier in Table 3.5, was analyzed in order to illustrate the consistency of the empirical methodology used in this investigation. The mobility matrix corresponds to the P-matrix: it is "egressive" and "row stochastic."[14] Yet, it cannot be considered a probability transition matrix because it is totally lacking in a uniform time dimension: "First job" to "present vocation" can represent nearly a lifetime of work experience for older workers or just a few years for the relatively young. Due to the small number of categories, it is a good example for illustration purposes, however. There were seventeen categories in the Blau and Duncan study. They are as follows:

1. Professionals, Self-Employed;
2. Professionals, Salaried;
3. Managers;
4. Salesmen, Other;
5. Proprietors;
6. Clerical;
7. Salesmen, Retail;
8. Craftsmen, Mfg.;
9. Craftsmen, Other;
10. Craftsmen, Construction;
11. Operatives, Mfg.;
12. Operatives, Other;
13. Service;
14. Laborers, Mfg.;
15. Laborers, Other;
16. Farmers;
17. Farm Laborers.

The city-block metric with retention rates in the main diagonal was used in this example. The resulting lower-triangular distance matrix is presented in Table 5.1. In Figure 5.3 the ordered cluster analysis results (diameter method) are reported.

Table 5.1

City-Block Distance Matrix Example

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(2)	1.036															
(3)	1.196	0.802														
(4)	1.482	1.080	0.618													
(5)	1.466	1.130	0.808	0.630												
(6)	1.295	0.911	0.585	0.625	0.697											
(7)	1.369	0.983	0.615	0.537	0.615	0.272										
(8)	1.436	1.130	0.906	0.830	0.846	0.721	0.611									
(9)	1.447	1.161	0.899	0.851	0.897	0.714	0.572	0.419								
(10)	1.490	1.308	1.084	1.036	0.994	0.923	0.821	0.612	0.509							
(11)	1.488	1.226	0.992	0.992	0.994	0.737	0.669	0.432	0.481	0.666						
(12)	1.476	1.216	0.982	0.958	0.950	0.761	0.659	0.482	0.441	0.536	0.408					
(13)	1.465	1.221	1.029	1.001	1.041	0.794	0.736	0.659	0.662	0.787	0.419	0.465				
(14)	1.504	1.324	1.130	1.130	1.140	0.843	0.807	0.652	0.663	0.792	0.260	0.496	0.449			
(15)	1.482	1.236	1.042	1.018	1.000	0.781	0.719	0.550	0.529	0.610	0.388	0.210	0.387	0.430		
(16)	1.515	1.381	1.213	1.189	1.115	0.934	0.944	0.809	0.812	0.847	0.721	0.691	0.746	0.749	0.683	
(17)	1.584	1.442	1.276	1.252	1.172	0.989	0.953	0.816	0.835	0.872	0.630	0.570	0.605	0.578	0.480	0.295

Figure 5.3

Cluster Analysis Example

```
Value of
Cluster              Occupation Codes

           0 0 0 0 0 0 0 1 0 0 1 1 1 1 1 1 1
           1 2 3 6 7 4 5 0 9 8 4 1 3 5 2 7 6

 0.210     . . . . . . . . . . . . . XXX . .
 0.260     . . . . . . . . . . XXX . XXX . .
 0.272     . . . XXX . . . . . XXX . XXX . .
 0.295     . . . XXX . . . . . XXX . XXX XXX
 0.419     . . . XXX . . . XXX XXX . XXX XXX
 0.449     . . . XXX . . . XXX XXXXX XXX XXX
 0.496     . . . XXX . . . XXX XXXXXXXXX XXX
 0.612     . . . XXX . . XXXXX XXXXXXXXX XXX
 0.615     . . XXXXX . . XXXXX XXXXXXXXX XXX
 0.625     . . XXXXXXX . XXXXX XXXXXXXXX XXX
 0.749     . . XXXXXXX . XXXXX XXXXXXXXXXXXX
 0.808     . . XXXXXXXXX XXXXX XXXXXXXXXXXXX
 0.872     . . XXXXXXXXX XXXXXXXXXXXXXXXXXXX
 1.036     XXX XXXXXXXXX XXXXXXXXXXXXXXXXXXX
 1.276     XXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 1.584     XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

The results appeal to intuition. The white-collar occupations, appearing to the left of the configuration, oppose the blue-collar, service, and farm occupations which appear towards the right. In the middle of the configuration, the three "skilled" classifications are found. Note that (11) "opeartives, mfg." clusters initially with (14) "laborers, mfg." rather than (12) "operatives, other." All non-farm operative and laborer classifications plus the (13) "service" category, however, cluster at a value which is only one-fourth of the maximum potential distance of 2.0. Both "professional" classifications (1 and 2) remain distinct until relatively late. This is due, in part, to the

relatively high retention rates for these categories which results in the largest base distance of 1.08 (sum of retention rates). High retention rates tend to isolate an occupation category, as noted previously. The relative distinctiveness of some cluster sets is also apparent. Examples include the non-professional white-collar and craftsmen groups. The two farm categories also form a somewhat distinct cluster.

Since the clusters are ordered by the Gruvaeus and Wainer method, additional information is present in the configuration. For example, it can be concluded that (3) "managers" are more proximal with the (6) "clerical" class than with the (7) "salesmen, retail" category. Examination of the distance matrix reveals this to be the case. The ordering of the occupations in the cluster configuration is unique except for reflection. All told, this example illustrates the usefulness of the methodology in partitioning of the categories into relatively homogeneous groups on the basis of mobility pattern commonalities and linkages.

Summary

Considerable effort has been devoted in this study to development of the empirical methodology which was reported in this chapter. Its main purpose was to facilitate interpretation of the structure of inter-occupational movements through systematic application of theoretical tools. Three major divisions of the empirical methodology were noted. First, the two theoretical mobility models (egressive and ingressive) were discussed along with the several methods for presenting the data in stochastic form. One such method for each basic model was chosen for study.

Second, the theoretical distance model was employed in order to assess intercategory similarity, that is, to further concentrate the information in the initially vast mobility matrix with its 90,000+ cells. Because of its theoretical purity, the city-block metric was assigned the primary role in analysis of the P-matrix and R-matrix. In order to provide a standardized basis for mutual interchange comparison, a common value for the diagonal was suggested. For the city-block matrix, it was argued that such a common diagonal value affects the rank order of the distance coefficients only up to the point at which the common diagonal value is less than the largest off-diagonal element. Further increments do not affect the rank order of the distance coefficients. It was shown that the Euclidean formulation tends to place even greater emphasis on the mutual interchange coefficients. Further, with increments in the common diagonal elements, the distance coefficients approach a stable rank order such that that rank order is dependent only upon the sum of mutual interchange coefficients (in the case of the R-matrix, $r_{ij} + r_{ji}$). In the case where two distance values have equal sums of mutual interchange coefficients, the rank order of those two distances was shown to be unaffected by increments in the diagonal. Use of the Euclidean distance function with a value of one in the main diagonal of the matrix insures that distance values with large mutual interchange coefficients will receive special emphasis. Thus, the city-block formulation is seen as placing greater emphasis on commonalities in patterns of movement while the Euclidean formulation with constant diagonal elements stresses the direct linkage aspects of occupational interchange.

Third, the methodology of cluster analysis was employed to enable an ascertainment of the occupations which hold relatively common positions in a multidimensional space. Johnson's monotonically invariant and hierarchical clustering algorithm was used. His computer program was modified to incorporate the Gruvaeus and Wainer ordering procedure which uses more of the information in the distance matrix in construction of the cluster configuration. Of the two possible methods for deployment of Johnson's technique, the diameter method was selected due to closer correspondence with the research question.

The conformance of the theoretical models to the research question is, thus, substantial. Mobility coefficients determine the projections of points onto a multidimensional set of axes. The relative position of each point with respect to all other points is summarized in the distance matrix. Occupations with relatively similar projections on the axes of that space will have relatively small interpoint distances. Cluster analysis assists in the determination of such groups of occupations which hold these proximal positions. Also, the methodology is capable of handling a very large number of cases and presenting the results in a meaningful configuration. At each step, from the initial raw data to final cluster representation, the methodology "compacts" the abundance of information in the empirical data matrix and systematically extracts the important structural relationships which otherwise lie hidden in that data matrix. Thus, the empirical methodology is both a consistent and systematic procedure for the study of the structure of interoccupational mobility.

FOOTNOTES

[1]R. B. Cattell and M. A. Coulter, "Principles of Behavioral Taxonomy and the Mathematical Basis of the Taxonome Computer Program," The British Journal of Mathematical and Statistical Psychology 19 (1966): 237-269.

[2]R. R. Sokal and P. H. A. Sneath, Principles of Numerical Taxonomy (San Francisco: W. H. Freeman, 1963).

[3]Actually, this statement is true only if deaths are taken into account. Retrospective reporting, the sample technique for the data base of this investigation, obviously cannot take deaths into account.

[4]Continuous in the sense that the persons were working in both time periods. Of course, such persons could have been unemployed or non-participants in the labor force in the intervening five year period. Nevertheless, those working in both points in time are, undoubtedly, the more stable of the work force.

[5]For a discussion of the nature of "elevation" see Lee J. Cronbach and Goldine C. Gleser, "Assessing Similarity Between Profiles," The Psychological Bulletin 50 (1953): 460.

[6]P. E. Green and Frank J. Carmone, Multidimensional Scaling (Boston: Allyn and Bacon, Inc., 1970), pp. 24-27.

[7]Ibid., p. 27, Figure 2-3.

[8]Ibid.

[9]Warren S. Torgerson, Theory and Methods of Scaling (New York: John Wiley and Sons, Inc., 1958), p. 254.

[10]Stephen S. Johnson, "Hierarchical Clustering Schemes," Psychometrika 32 (September 1967): 249.

[11]G. Gruvaeus and H. Wainer, "Two Additions to Hierarchical Cluster Analysis," British Journal of Mathematical and Statistical Psychology (September 1972): 200-205.

[12]S. Rosenberg and A. Sedlak, "Structural Representations of Implicit Personality Theory," in Advances in Experimental Social Psychology, ed. L. Berkowitz (New York: Academic Press, 1972), p. 269.

[13]Johnson, "Hierarchical Clustering Schemes," p. 252.

[14]Actually, the rows sum to somewhat under 1.0 or 100 (percentage terms) since men not reporting first jobs were not shown separately.

CHAPTER VI

EMPIRICAL IMPLEMENTATION OF THE THEORETICAL MOBILITY MODELS

So far, theory has been emphasized and actual implementation of the mobility models has been neglected. In this chapter the finer details of implementation of the egressive and ingressive models are discussed. Topics include choice of data base, detail and level of occupational classification, sample universe selected, construction of the intermediate "count" matrix (N), and final specification of the P and R matrices.

The "Public Use Samples of Basic Records from the 1970 Census" served as the data base for this investigation. In the 5% data samples for that Census, respondents were asked, in addition to current job status, to report work status for April, 1965. Also, for the first time, the individual data records were provided for public use for a full one-in-a-hundred cases and, thus, approximately two million observations. Consequently, this data source is the closest approximation to an ideal data base for a highly disaggregated study of occupational manpower flow patterns that is available to the general public.

Large scale disaggregation was necessary owing to lack of concensus on the occupational classification problem, discussed in Chapter IV. The detailed category level of 441 separate codes in 1970. was pared to 304 groups, a subaggregation necessitated by the extremely small populations in some of the detailed categories as well as machine capacity problems. Some of the major elements in this reduction were as follows:

1. In the "professional, technical and kindred worker" aggregate classification, where many of the detailed categories were particularly small, these small categories were aggregated to form larger groups. I used a 20,000 workers in 1970 Census count as the cutoff. In general, occupations with populations greater than 20,000 workers in 1970 were not aggregated, the major exception being the numerous categories in the "teachers, college and university" subgroup. All occupations in this subgroup were aggregated.
2. Apprentice occupation classes were aggregated with their respective supra-group. For example, "pressmen apprentices" were aggregated with "pressmen and plate printers, printing."
3. Other aggregations, where possible, were formed along "situs" lines. When such aggregations could not objectively be made, the categories were allocated to their appropriate n.e.c. groups. For example, "power station operators" were allocated to the "craftsmen and kindred workers, n.e.c." group.
4. One extra category resulted from split of the "managers and administrators, n.e.c." group into salaried and self-employed components, a distinction frequently made in mobility studies in an attempt to separate the "proprietors" class.
5. Each of the twelve allocation categories was excluded.

Such aggregation was kept to a minimum. When it was necessary, there was an attempt to employ "situs" criteria. In Appendix A the transformation of Census codes into the scheme used in this investigation is presented.

An "employed" base for the sample universe was used for both reported time periods. Thus, non-work status includes both the unemployed and those classified as not-in-labor force. All individuals who were classified as employed in either time period were included in the basic "count" matrix; yet, a lower age limit of 16 years was operational. Thus, for the egressive model, all individuals were at least 21 years of age in 1970. Individuals less than 14 years of age in 1970 were excluded from the sample regardless of work status. Those remaining who were also less than 21 years of age were allocated to non-work status.

The "count" matrix (N), after the above preliminaries, was created by tabulating each person's transformed occupation codes for both time periods in a two-dimensional array. The "i,j" element of N records, of course, the sampled number of changes from status "i" to status "j." This matrix has 309 rows (0 through 308) and 305 columns (1 through 305). The "core" occupation partition of N was rows and columns 1 through 304. Row "0" was employed for those individuals, working in 1965 and 1970, who failed to report occupation status for 1965. This group averaged about 1 in 20 for those employed in both time periods. Rows 305 through 308 were used to house the non-work status group of 1965 (individuals who were working in 1970) by four educational categories: 1. completed less than high school (305); 2. completed high school (306); 3. completed one to three years college (307); 4. completed four years or more of college (308). Column 305 contains those non-work persons not working in 1970 who worked in 1965. All told, over 800,000 individual records were used in the construction of the count matrix.

The P-matrix was implemented in the manner discussed in Chapter V: the row sum of N was calculated, excluding movements to non-work status. Each "i,j" element was then divided by that row sum to yield a row stochastic distribution for each category of employment. But, for the R-matrix, the process was more tedious. Recall that the purpose of the R-matrix is to reflect the percentage distribution of in-movements to a given job category from non-work status and other occupations. The movements from non-work status tend to be exaggerated relative to occupational movements owing to the presence of individuals who worked in 1965 but failed to report occupation for 1965 (elements n_{oj}). To correct for this bias, the distribution of in-movements from the not-reported category was assumed to be equal to the sampled distribution as evidenced by column elements between rows 1 and 304, inclusive.

The following formulas for r_{ij}, which includes the adjustment of off-diagonal elements, are:

$$r_{ij} = \frac{n_{ij}\ (\beta_j + n_{oj})}{\beta_j\ (\beta_j + \Sigma_j + n_{oj})}, \text{ for all } (i,j = 1, 2, \ldots, 304)\ (i \neq j)$$

$$r_{ij} = 0, \text{ for all } (i = j)$$

$$r_{ij} = \frac{n_{ij}}{\beta_j + \Sigma_j + n_{oj}}, \text{ for all } j = (1, 2, \ldots, 304) \text{ and } i = (305, \ldots, 308)$$

where, $\beta_j = \sum_{i=1}^{304} n_{ij} - n_{jj}$ and $\Sigma_j = \sum_{i=305}^{308} n_{ij}$. The proof that $\sum_{i=1}^{308} r_{ij} = 1.0$ is trivial. In effect, the adjustment spreads the not-reported category over the relevant n_{ij} categories in relation to the relative size of each respective column coefficient.

This ends the discussion of specifics of model implementation. A discussion of general characteristics of rates of movement for both the P and R matrices follows.

CHAPTER VII

EMPIRICAL EVIDENCE: RATES OF MOVEMENT

Of those persons who were classified as working in both 1965 and 1970, one-third were occupationally mobile, based on the 304 categories employed in this study. About one in four (twenty-six percent) of all workers in 1970 was in non-work status in the initial time period. These rates of movement are weighted averages for the entire sample of occupations. As will be noted, there is substantial variation in these rates among the job types.

This chapter discusses the level and distribution of the mobility coefficients in the probability transition (P) and recruitment dependence (R) matrices. First, the retention rates (diagonal elements of the P-matrix) will be examined. Then, the ingressive rates of movement from the four educational divisions of the non-work status category will be analyzed. Some evidence on the degree of structure to occupational movements will follow: The off-diagonal coefficients of the P and R matrices, excluding the non-work status categories of the R-matrix, are tallied in a frequency distribution. Furthermore, the percentage of occupational movements accounted for by each frequency class is computed. The 100 largest of such elements are then examined. Measures are presented which indicate a hierarchical pattern to occupational interchange.

The Census reliability check of the retrospective responses to the 5-year question on work status indicated a probable understatement of the work force of about <u>ten</u> percent. Such understatement tends to bias

the retention rates and the ENR's upward since youths are less likely to report having worked in the base period and are the most likely to be occupationally mobile. From the sample used in this study, my calculations indicate an understatement of about <u>four</u> percent, however. This estimate was computed in the following manner: From published statistics, the ratio of 1965/1970 annual average employment was computed; this ratio was multiplied by the sampled value of total 1970 employment, obtained from the personal records included in the Census 1/100 tapes, to obtain a base figure for the 1965 level of employment.[1] A percentage difference of 4.14 was found between the 1965 base and the sampled value of 1965 employment, certainly significantly less than the Census estimate. Moreover, this test has a built-in upward bias since deaths are not taken into account: only the continuous population can, of course, be sampled through retrospective reporting. The upward bias on retention rates and the entrance to work-status rates (ENR's) which result from understatement of the 1965 work force is probably not as great as indicated by the Census reliability study.

The Retention Rates

The unweighted mean retention rate for all occupational categories was 66.8 percent with a standard deviation of 12 percent; thus, the coefficient of variation is a relatively low 19 percent. The median value was 67.1 percent. In the table below, the frequency distribution of retention rates is presented after conversion to standard scores. The differences between the observed Z-score frequency distribution and the theoretical normal distribution indicates the skewness of the distribution. In this comparison, there is a particular concentration

Table 7.1

Standardized Score Frequency Distribution of
Sampled Retention Rates

Z-Scores	Frequency	Percent Frequency	Theoretical Percent Frequency	Actual - Theoretical
Less than -2.00	12	3.95	2.28	1.67
-2.00 to -1.99	29	9.54	13.59	-4.05
-1.00 to -0.50	44	14.47	14.98	- .51
-0.50 to 0.00	58	19.08	19.15	- .07
0.00 to 0.50	60	19.74	19.15	.59
0.50 to 1.00	59	19.41	14.98	4.43
1.00 to 2.00	39	12.83	13.59	- .76
Greater than 2.00	3	.99	2.28	-1.29
Total	304	100.00	100.00	0.00

of values in the range of 73 to 79 percent retention and a relative dreath in the 42 to 54 percent retention range. The actual distribution compares favorably in the unit standard deviation range about the mean. Note also that there are comparatively too many low values (less than 42 percent retention) and too few high ones (greater than 82 percent retention).

There is probably a degree of upward bias to the sampled retention rates, that is, these rates understate the value of their complement, occupational mobility. Three reasons for this are as follows: (1) youths are least likely to recall having worked in the initial time period and

they are, potentially, the most likely to move; (2) there is, probably, a tendency to report past job status as current occupation on the part of respondents; and, (3) there is a built-in understatement of mobility in the model since 5-years is a period of sufficient length for an individual to return to initial job type after considerable occupational movement. The total upward bias of retention rates is not known. It is, however, probably greatest for youth occupation categories.

In Table 7.2, the highest fifty and lowest fifty retention rates, along with their respective occupation title, appear in rank order form. Standard scores are also presented. The retention rates range from a high of 97 percent (dentists) to 14 percent (farm laborers, family). They are intuitively interesting as indicators of the career status of the categories. The highest coefficients are, in general, associated with the professional and technical occupations. However, occupations from most of the other major groups are present. In fact, occupations from a variety of aggregate groups can be found in almost any given range of retention rates.

Note the abundance of n.e.c., miscellaneous specified (m.s.), and not specified (n.s.) job categories in the lower levels of the rank ordering. As was reported in Chapter IV, many of such general titles are associated with youth employment and, therefore, would be expected to have low retention rates. The high out-mobility rates from these categories conform with expected behavior of youth-transition jobs. Many of these jobs are ostensibly low in skill requirements and, therefore, easily accessible by youths.

Table 7.2

Rank Order of the Fifty Highest and the Fifty Lowest Retention Rates

Occupation	P_{II}	Z-Value	Occupation	P_{II}	Z-Value
DENTISTS	0.9654	2.4063	BILLING CLERKS	0.5543	-0.9146
PHYSICIANS	0.9536	2.3110	RECEPTIONISTS	0.5531	-0.9243
LAWYERS&JUDGES	0.9384	2.1882	HUCKSTERS&PEDDLERS	0.5525	-0.9291
LOCOMOTIVE ENGINEERS	[illegible]	[illegible]	ADVERTISING AGENTS	0.5514	-0.9380
HEALTH PRACT.,N.E.C.	0.8973	1.8562	FILE CLERKS	0.5497	-0.9517
PHARMACISTS	0.8907	1.8029	COMPUTER OPERATORS	0.5461	-0.9808
RAILROAD CONDUCTORS	0.8879	1.7803	SALESMEN,SERV.&CONST.	0.5453	-0.9873
RADIOLOGIC TECH'S	0.8649	1.5945	ANIMAL CARETAKERS	0.5443	-0.9954
HAIRDRESSERS	0.8636	1.5840	CHAMBERMAIDS&MAIDS	0.5440	-0.9978
PILOTS&FLIGHT ENGINEERS	0.8625	1.5751	OFFICE MACHINE;CALC.	0.5437	-1.0002
FIREMEN	0.8579	1.5379	ATHLETES&KINDRED WK'S	0.5431	-1.0051
POSTMASTERS&MAIL SUPT'S	0.8544	1.5097	FARM MANAGERS	0.5407	-1.0245
DENTAL LAB. TECH'S	0.8535	1.5024	WRITERS&ENTERT'S,N.E.C.	0.5397	-1.0325
REGISTERED NURSES	0.8524	1.4935	RELIGIOUS WK'S	0.5367	-1.0568
CLERGYMEN	0.8524	1.4935	OPRTS.,M.S.	0.5363	-1.0600
PRACTICAL NURSES	0.8518	1.4886	FOOD SERV. WK'S,N.E.C.	0.5340	-1.0786
AIR TRAFFIC CONTROLLERS	0.8516	1.4870	LIBRARY ATTENDANTS	0.5306	-1.1060
BARBERS	0.8476	1.4547	MACH. OPRTS.,N.S.	0.5293	-1.1165
ARCHITECTS	0.8472	1.4515	VEHICLE WASHERS	0.5278	-1.1287
DRESSMAKERS,EXC.FACTORY	0.8252	1.2738	CLERICAL WK'S,M.S.	0.5262	-1.1416
PLUMBERS&PIPE FITTERS	0.8250	1.2722	COUNTER CLERKS,EXC.FOOD	0.5248	-1.1529
OPTICIANS	0.8186	1.2205	RECREATION WK'S	0.5139	-1.2409
ELECTRICIANS	0.8171	1.2083	SHOEMAKING MACH. OPRTS.	0.5125	-1.2523
TOOL&DIE MAKERS	0.8158	1.1978	MINE OPRTS.,N.E.C.	0.5113	-1.2619
PSYCHOLOGISTS	0.8143	1.1857	TECHNICIANS,N.E.C.	0.5110	-1.2644
SECRETARIES	0.8137	1.1809	LUMBERMEN	0.5083	-1.2862
PAINTERS&SCULPTORS	0.8101	1.1518	MAIL HANDLERS,EXC.P.O.	0.4838	-1.4841
THERAPISTS	0.8090	1.1429	SAILORS&DECKHANDS	0.4812	-1.5051
SCH. ADMIN.,ELEM.&SEC.	0.8053	1.1130	NEWSBOYS	0.4795	-1.5188
LIBRARIANS	0.8044	1.1057	PARKING ATTENDANTS	0.4793	-1.5204
PHYSICISTS&ASTRONOMERS	0.8043	1.1049	OFFICE MACHINE;BILLING	0.4757	-1.5495
ASBESTOS WK'S	0.8031	1.0952	MESSENGERS&OFFICE BOYS	0.4706	-1.5907
MAIL CARRIERS, P.O.	0.8028	1.0928	RESEARCH WK'S,N.E.C.	0.4620	-1.6602
INSPECTORS, PUB.ADMIN.	0.8011	1.0791	FOOD COUNTER WK'S	0.4592	-1.6828
TEACHERS, COLLEGE&UNIV.	0.8004	1.0734	COLLECTORS, BILL&ACCT.	0.4475	-1.7773
CHEMICAL ENGINEERS	0.8000	1.0702	KNIT'S,LOOP'S&TOP'S	0.4422	-1.8201
JEWELERS&WATCHMAKERS	0.7994	1.0654	CONSTRUCTION LABORERS	0.4364	-1.8670
MEAT WRAPPERS,RETAIL	0.7971	1.0468	DISHWASHERS	0.4351	-1.8775
LIFE&PHYSICAL SCIENT'S	0.7959	1.0371	WAREHOUSEMEN,N.E.C.	0.4193	-2.0051
CIVIL ENGINEERS	0.7951	1.0306	ATTENDANTS&USHERS,R.&A.	0.4073	-2.1021
DIETITIANS	0.7932	1.0153	ENUMERAT'S&INTERVIEW'S	0.3953	-2.1990
MECHANICAL ENGINEERS	0.7920	1.0056	CARPENTERS' HELPERS	0.3897	-2.2442
FUNERAL DIR.&EMBALMERS	0.7899	0.9886	STOCK HANDLERS	0.3581	-2.4995
OFFICIALS; LODGES, ETC.	0.7896	0.9862	MECHANICS&REPAIRMEN,N.S.	0.3459	-2.5981
PRESSMEN&PLATE PRINTERS	0.7871	0.9660	GARAGE WK'S	0.3383	-2.6595
PATTERN&MODEL MAKERS	0.7866	0.9620	LABORERS,N.S.	0.3259	-2.7596
SEWERS&STICHERS	0.7847	0.9466	CLERICAL WK'S,N.S.	0.3004	-2.9656
KINDERGARTEN TEACHERS	0.7824	0.9280	OPRTS.,N.S.	0.2812	-3.1207
MECHANICS,R.R.&CAR SHOP	0.7812	0.9183	BUSBOYS	0.2403	-3.4511
MEAT CUTTERS,EXC. MFG.	0.7792	0.9022	FARM LABORERS,FAMILY	0.1374	-4.2824

The retention rate level is an important determinant of the primary distance model for the P-matrix. As noted previously, a high retention rate acts to isolate an occupation in the metric space. In contrast, city-block distance between two categories with low retention rates is initially low in terms of base distance. Occupations with low retention rates would, then, tend to cluster, provided they do not have strong attachments through mobility to career status categories. Port-of-entry jobs must have such significant attachments in order to overcome the low base distance phenomenon. Thus, among the occupations with low base distances, the distinction between those which cluster and those which have significant attachments to job types with career potential is important for distinguishing "youth" from "port-of-entry" categories.

The Entrance Rate Components

As is evidenced by the statistics in Table 7.3, variation between occupations in ENR's is substantial. The standard deviation for ENR_4 is nearly twice the size of its mean. This variance is considerably greater than that of the retention rates: The smallest coefficient of variation is over three times the size of the retention rate coefficient.

The correlation matrix between the four components is presented in Table 7.4. These coefficients are not of substantial magnitude although all but one--curiously between ENR_3 and ENR_4--is significant at the five-percent level, at least. The correlation matrix was factor analyzed by the "principal component" method in order to assess the underlying dimensionality.[2] Two eigen values were found to be greater than unity, the general "rule of thumb" for the number of factors problem. The first two factors accounted for three-fourths of the total variance

Table 7.3

Mean, Standard Deviations and Coefficients of Variation for Each of the Entrance Rate Components

	Mean	Standard Deviation	Coefficient of Variation
ENR_1	13.55%	13.01%	96 %
ENR_2	15.65	9.46	60
ENR_3	7.43	5.94	80
ENR_4	6.03	10.74	178

Table 7.4

Correlation and Factor Analysis Results for Entrance Rate Categories

	Correlation Matrix			
	1	2	3	4
ENR_1	1.00			
ENR_2	.24**	1.00		
ENR_3	- .14*	.39**	1.00	
ENR_4	- .42**	- .46**	.09	1.00

	Factor Weights	
	Dimension 1	Dimension 2
ENR_1	.66	- .46
ENR_2	.79	.43
ENR_3	.19	.90
ENR_4	- .81	.26
Sum of Squares	1.76	1.28

*Significant at five-percent level
**Significant at one-percent level

between the ENR components. The correlations between the factors and the ENR components facilitates interpretation of each dimension. The first dimension is dominated by the fourth and second ENR variates. Occupations which depend heavily on non-work status of high school or lower caliber will score positively on this dimension; in contrast, those which depend heavily on college graduates will score negatively. The second dimension is weighted towards intermediate education: college 1 to 3 years. These factor dimensions appear intuitive. "Physicians" (ENR_4 = .57) scored lowest on factor dimension 1; "Hairdressers" (ENR_2 = .51) were highest. "Newsboys" (ENR_1 = .73) scored lowest on the second dimension while the highest factor score was recorded for "Airline Stewardesses" (ENR_3 = .35).

Frequency/Tally: P-Matrix

In order to analyze the degree of structure to occupational movements, an algorithm was devised which tallied the number of occupational movements along with the frequency count of the non-zero off-diagonal coefficients. For example, assume a "p_{ij}" coefficient of .04 which corresponds to 100 occupational movements. Owing to this sampled mobility coefficient, the frequency count for coefficient class ".02 to .05" would be incremented by a value of one and the tally count would be increased by 100. After all non-zero, off-diagonal coefficients are analyzed, the "tally" total is equal to the total number of occupational movements. The frequency and tally values are then converted to percentage distributions. Of the 92,112 off-diagonal elements, 63,152 (over two-thirds) are zero. Over 160,000 sampled occupational movements are accounted for by the remaining 28,960 elements of the count matrix.

In Table 7.5, the Frequency/Tally percentage distributions for the P-matrix are presented. The results do not evince strong structure to occupational movements. All but 17.5 percent of the non-zero, off-diagonal coefficients are less than one-half of one percent. Yet, these same elements accounted for almost one-half of the total number of occupational movements. By the same token, however, the 96 coefficients greater than or equal to .05 accounted for about 7.5 percent of all occupational moves. Thus, although there is some, certainly important, evidence of structure, these results suggest that, in the main, the degree of structure is faint.

Frequency/Tally: R-Matrix

Use of the above methodology on the R-matrix produced somewhat similar results. As reported in Table 7.6, seventy percent of the non-ENR, non-zero, off-diagonal coefficients are less than one-half of one percent. About a third of all occupational movements are reflected in these coefficients. There are, however, significantly more values in the higher ranges, due in part to the specification of the ingressive model: 318 coefficients are greater than or equal to five percent; they account for fifteen percent of all occupational moves. Certainly, this is evidence of structure; but, it is not evidence of *extreme* structure.

Hierarchy of Occupational Movement Patterns

In Tables 7.7 and 7.8, respectively, the largest off-diagonal elements from the P and R matrices are presented in rank order form, along with corresponding category titles. The mutual interchange coefficient is also included. A coefficient of hierarchy is computed which is equal to the absolute value of the difference in MI coefficients

Table 7.5

Frequency/Tally of Mobility Coefficients and Occupational Movements: P-Matrix

P_{ij} Class Limits	Percent Frequency	Cumulative Percent Frequency	Percent Tally	Cumulative Percent Tally
0.000 to 0.005	82.50%	94.50%	46.06%	46.06%
0.005 to 0.010	10.61	97.84	17.18	63.24
0.010 to 0.020	4.71	99.32	15.60	78.84
0.020 to 0.050	1.85	99.90	13.73	92.57
0.050 to 1.000	.33	100.00	7.43	100.00
Total	100.00		100.00	

Table 7.6

Frequency/Tally of Mobility Coefficients and Occupational Movements: R-Matrix

R_{ij} Class Limits	Percent Frequency	Cumulative Percent Frequency	Percent Tally	Cumulative Percent Tally
0.000 to 0.005	69.22%	69.22%	32.59%	32.59%
0.005 to 0.010	15.93	85.15	16.94	49.53
0.010 to 0.020	9.45	94.60	18.07	67.60
0.020 to 0.050	4.30	98.90	17.58	85.18
0.050 to 1.000	1.10	100.00	14.82	100.00
Total	100.00		100.00	

Table 7.7

Rank Order of the One Hundred Largest Off-Diagonal Probability Transition Coefficients and Related Statistics

Occupation I	Occupation J	P_{IJ}	P_{JI}	F_{IJ}	Adjusted P_{IJ}^*
FARM LABORERS,FAMILY	FARMERS	0.2805	0.0240	0.8423	0.3252
FARM LABORERS,FAMILY	FARM LABORERS,WAGES&S.E.	0.2252	0.0028	0.9753	0.2611
STENOGRAPHERS	SECRETARIES	0.1967	0.0055	0.9452	0.4734
COMPUTER PROGRAMMERS	COMPUTER SPECIALISTS	0.1536	0.0413	0.5761	0.3897
ELEMENTARY SCH.TEACHERS	SECONDARY SCH. TEACHERS	0.1489	0.0352	0.6175	0.4581
TELEPHONE LINEMEN	TELEPHONE INSTALLERS	0.1380	0.0109	0.8533	0.3182
COOKS,P.H.	MAIDS&SERVANTS,P.H.	0.1282	0.0099	0.8563	0.3571
TYPISTS	SECRETARIES	0.1271	0.0178	0.7544	0.3203
HOUSEKEEPERS,P.H.	MAIDS&SERVANTS,P.H.	0.1260	0.0240	0.6601	0.3587
MECHANICS&REPAIRMEN,N.S.	MECHANICS,HEAVY EQUIP.	0.1001	0.0030	0.9409	0.1531
SCH. ADMIN.,COLLEGE	MGRS.&ADMIN.,SAL.	0.0978	0.0011	0.9777	0.2200
MGRS.&ADMIN.,SAL.	MGRS.&ADMIN.,S.E.	0.0973	0.0648	0.2004	0.2450
RADIO&T.V. ANNOUNCERS	MGRS.&ADMIN.,SAL.	0.0970	0.0002	0.9952	0.2353
CARPENTERS' HELPERS	CARPENTERS&FLOOR LAYERS	0.0923	0.0028	0.9417	0.1513
ECONOMISTS	MGRS.&ADMIN.,SAL.	0.0916	0.0013	0.9712	0.2431
KINDERGARTEN TEACHERS	ELEMENTARY SCH.TEACHERS	0.0880	0.0179	0.6621	0.4043
COMPUTER OPERATORS	COMPUTER PROGRAMMERS	0.0867	0.0058	0.8747	0.1911
AIRLINE STEWARDESSES	SECRETARIES	0.0849	0.0012	0.9730	0.2500
MECHANICS,FARM IMP.	MECHANICS,HEAVY EQUIP.	0.0847	0.0022	0.9490	0.2020
CLERICAL WK'S,N.S.	BOOKKEEPERS	0.0828	0.0135	0.7199	0.1184
CLERICAL WK'S,N.S.	TYPISTS	0.0821	0.0233	0.5575	0.1174
RELIGIOUS WK'S	CLERGYMEN	0.0811	0.0068	0.8450	0.1750
SALES MGRS.,EXC.RETAIL	MGRS.&ADMIN.,SAL.	0.0794	0.0068	0.8423	0.2624
ADVERTISING AGENTS	MGRS.&ADMIN.,SAL.	0.0791	0.0015	0.9625	0.1762
COOKS,P.H.	COOKS,EXC. P.H.	0.0769	0.0025	0.9372	0.2143
SCH. ADMIN.,COLLEGE	MGRS.&ADMIN.,S.E.	0.0756	0.0008	0.9793	0.1700
RECEPTIONISTS	SECRETARIES	0.0754	0.0053	0.8678	0.1683
RESEARCH WK'S,N.E.C.	TEACHERS, COLLEGE&UNIV.	0.0748	0.0076	0.8147	0.1390
CREDIT MEN	MGRS.&ADMIN.,SAL.	0.0746	0.0012	0.9693	0.1741
MILLWRIGHTS	MECHANICS,HEAVY EQUIP.	0.0737	0.0047	0.8798	0.2956
STATIONARY FIREMEN	SEWERS&STICHERS	0.0727	0.0075	0.8124	0.2213
KNIT'S,LOOP'S&TOP'S	TEXTILE OPRTS.,N.E.C.	0.0717	0.0072	0.8179	0.1285
BRAKEMEN&FIREMEN,R.R.	LOCOMOTIVE ENGINEERS	0.0712	0.0047	0.8770	0.2534
OFFICE MGRS.,N.E.C.	BOOKKEEPERS	0.0706	0.0102	0.7473	0.1800
FARM FOREMEN	FARM LABORERS,WAGES&S.E.	0.0705	0.0107	0.7354	0.2051
LIBRARY ATTENDANTS	LIBRARIANS	0.0703	0.0175	0.6010	0.1493
SALES REP'S,MFG.	SALES MGRS.,EXC.RETAIL	0.0699	0.0211	0.5371	0.1832
STENOGRAPHERS	TYPISTS	0.0698	0.0084	0.7856	0.1681
PAYROLL CLERKS	BOOKKEEPERS	0.0687	0.0066	0.8254	0.1894
BANK TELLERS	BANK OFFICERS&FIN.MGRS.	0.0684	0.0114	0.7151	0.1689
FARM MANAGERS	FARMERS	0.0670	0.0188	0.5610	0.1455
FARM MANAGERS	FARM LABORERS,WAGES&S.E.	0.0670	0.0058	0.8403	0.1458
CLERICAL WK'S,N.S.	SECRETARIES	0.0667	0.0105	0.7271	0.0953
MGRS.&ADMIN.,S.E.	MGRS.&ADMIN.,SAL.	0.0646	0.0973	0.2004	0.2205
SHERIFFS,BAILIFFS,ETC.	POLICEMEN&DETECTIVES	0.0648	0.0146	0.6318	0.1882
OFFICE MACH.OP.:CALC.	BOOKKEEPERS	0.0646	0.0097	0.9785	0.1417
AUTHORS	EDITORS&REPORTERS	0.0643	0.0113	0.7013	0.2037
COMPUTER SPECIALISTS	MGRS.&ADMIN.,SAL.	0.0640	0.0011	0.9661	0.1962
TICK.,STA.,EXPRESS AGENTS	MGRS.&ADMIN.,SAL.	0.0618	0.0009	0.9704	0.1802
INSURANCE ADJUST'S,ETC.	MGRS.&ADMIN.,SAL.	0.0616	0.0009	0.9702	0.1839

Table 7.7 (continued)

Occupation I	Occupation J	P_{IJ}	P_{JI}	F_{IJ}	Adjusted P_{IJ}*
CHEMICAL ENGINEERS	KEY PUNCH OPERATORS	0.0615	0.0110	0.6968	0.1173
BRAKEMEN&FIREMEN,R.R.	RAILROAD CONDUCTORS	0.0615	0.0091	0.7426	0.2192
COMPOSITORS&TYPESETTERS	PRESSMEN&PLATE PRINTERS	0.0603	0.0162	0.5772	0.1799
MECHANICS&REPAIRMEN,N.S.	AUTOMOBILE MECHANICS	0.0598	0.0025	0.9204	0.0915
KNIT'S,LOOP'S&TOP'S	SEWERS&STICHERS	0.0596	0.0004	0.9884	0.1071
OPERATIONS RESEARCHERS	MGRS.&ADMIN.,SAL.	0.0594	0.0012	0.9597	0.1802
FOOD SERV. WK'S,N.E.C.	COOKS,EXC. P.H.	0.0589	0.0127	0.6460	0.1264
OFFICE MACHINE:BILLING	BOOKKEEPERS	0.0583	0.0049	0.8440	0.1111
BILLING CLERKS	BOOKKEEPERS	0.0576	0.0026	0.9143	0.1294
CABINETMAKERS	CARPENTERS&FLOOR LAYERS	0.0571	0.0042	0.8643	0.1596
CHILD CARE WK'S,P.H.	MAIDS&SERVANTS,P.H.	0.0569	0.0126	0.6371	0.1407
AIRLINE STEWARDESSES	TICKET&EXPRESS AGENTS	0.0566	0.0015	0.9468	0.1667
CARPENTERS' HELPERS	CONSTRUCTION LABORERS	0.0564	0.0075	0.7662	0.0924
DISHWASHERS	COOKS,EXC. P.H.	0.0563	0.0031	0.8965	0.0996
BOILERMAKERS	WELDERS&FLAMECUTTERS	0.0560	0.0028	0.9038	0.2241
RECREATION WK'S	ELEMENTARY SCH.TEACHERS	0.0558	0.0010	0.9658	0.1148
BANK TELLERS	BOOKKEEPERS	0.0556	0.0084	0.7364	0.1374
ELECTRICAL ENG. TECH'S	ELECTRICAL ENGINEERS	0.0554	0.0052	0.8294	0.1510
CHAMBERMAIDS&MAIDS	MAIDS&SERVANTS,P.H.	0.0552	0.0153	0.5661	0.1211
COMPUTER PROGRAMMERS	MGRS.&ADMIN.,SAL.	0.0551	0.0009	0.9668	0.1397
PUBLIC RELATIONS MEN	MGRS.&ADMIN.,SAL.	0.0550	0.0015	0.9485	0.1467
SOLDERERS	ASSEMBLERS	0.0547	0.0046	0.8451	0.1467
RADIO&T.V. ANNOUNCERS	EDITORS&REPORTERS	0.0545	0.0031	0.8931	0.1324
SALES ENGINEERS	MGRS.&ADMIN.,SAL.	0.0543	0.0009	0.9705	0.1818
STRUCTURAL METAL WK'S	FOREMEN,N.E.C.	0.0540	0.0010	0.9644	0.1653
OPRTS.,N.S.	MACH. OPRTS.,M.S.	0.0538	0.0107	0.6680	0.0749
TRUCK DRIVERS	DELIVERYMEN&ROUTEMEN	0.0538	0.0382	0.1698	0.1599
ENGINEERS,N.E.C.	MGRS.&ADMIN.,SAL.	0.0532	0.0020	0.9264	0.1297
OFFICE MACHINE:CALC.	COMPUTER OPERATORS	0.0532	0.0055	0.8116	0.1167
MEAT CUTTERS,MFG.	MEAT CUTTERS,EXC. MFG.	0.0530	0.0054	0.8138	0.1239
FARM MANAGERS	MGRS.&ADMIN.,SAL.	0.0526	0.0006	0.9760	0.1146
INDUSTRIAL ENGINEERS	MGRS.&ADMIN.,SAL.	0.0524	0.0030	0.8909	0.1832
FOOD COUNTER WK'S	WAITERS&WAITRESSES	0.0523	0.0065	0.7803	0.0967
STOCK&BOND SALESMEN	MGRS.&ADMIN.,SAL.	0.0521	0.0026	0.9044	0.2313
SALES MGRS.,RETAIL	MGRS.&ADMIN.,SAL.	0.0519	0.0067	0.7700	0.1229
INSURANCE AGENTS	MGRS.&ADMIN.,SAL.	0.0517	0.0065	0.7783	0.1560
MACH. OPRTS.,N.S.	MACH. OPRTS.,M.S.	0.0514	0.0109	0.6511	0.1032
ADULT ED. TEACHERS	TEACHERS, COLLEGE&UNIV.	0.0513	0.0019	0.9282	0.1373
RECEPTIONISTS	BOOKKEEPERS	0.0511	0.0041	0.8512	0.1143
GARAGE WK'S	AUTOMOBILE MECHANICS	0.0511	0.0057	0.7980	0.0772
BANK TELLERS	SECRETARIES	0.0509	0.0022	0.9176	0.1258
CHEMICAL ENGINEERS	MGRS.&ADMIN.,SAL.	0.0507	0.0009	0.9662	0.2533
SURVEYORS	CIVIL ENGINEERS	0.0506	0.0046	0.8338	0.1202
COLLECTORS, BILL&ACCT.	CREDIT MEN	0.0506	0.0043	0.8445	0.0915
SALES MGRS.,RETAIL	SALES CLERKS, RETAIL	0.0504	0.0152	0.5378	0.1195
BUSBOYS	COOKS,EXC. P.H.	0.0504	0.0008	0.9700	0.0663
SOLDERERS	CHECKERS&INSPECTORS;MFG.	0.0498	0.0004	0.9828	0.1333
PRINTING CRAFTSMEN,M.S.	FOREMEN,N.E.C.	0.0490	0.0003	0.9892	0.1748
SCH. ADMIN.,COLLEGE	TEACHERS, COLLEGE&UNIV.	0.0489	0.0137	0.5612	0.1100
OFFICE MACHINE,N.E.C.	BOOKKEEPERS	0.0485	0.0007	0.9714	0.1196

* Adjusted to reflect occupational movements only.

Table 7.8

Rank Order of the One Hundred Largest Non-ENR, Off-Diagonal Coefficients of Recruitment Dependence and Related Statistics

Occupation I	Occupation J	R_{IJ}	R_{JI}	D_{IJ}	Adjusted R_{IJ}*
FARMERS	FARM MANAGERS	0.6145	0.0078	0.9751	0.7011
BRAKEMEN&FIREMEN,R.R.	LOCOMOTIVE ENGINEERS	0.5336	0.0107	0.9612	0.5692
ELEMENTARY SCH.TEACHERS	SCH. ADMIN.,ELEM.&SEC.	0.4419	0.0067	0.9701	0.5040
BRAKEMEN&FIREMEN,R.R.	RAILROAD CONDUCTORS	0.4127	0.0160	0.9254	0.4776
FARM LABORERS,WAGE-ES.F.	FARM FOREMEN	0.3940	0.0048	0.9758	0.4656
POSTAL CLERKS	POSTMASTERS&MAIL SUPT'S	0.3912	0.0081	0.9592	0.4364
FARMERS	FARM LABORERS,FAMILY	0.3807	0.0814	0.6475	0.8663
ELEMENTARY SCH.TEACHERS	SECONDARY SCH. TEACHERS	0.3314	0.0410	0.7799	0.6515
MGRS.&ADMIN.,SAL.	MGRS.&ADMIN.,S.E.	0.3053	0.0808	0.5816	0.3348
CONSTRUCTION LABORERS	CEMENT&PLASTER WK'S	0.2993	0.0052	0.9645	0.3648
MAIDS&SERVANTS,P.H.	COOKS,P.H.	0.2874	0.0118	0.9212	0.4444
ELEMENTARY SCH.TEACHERS	KINDERGARTEN TEACHERS	0.2386	0.0091	0.9265	0.6096
MAIDS&SERVANTS,P.H.	HOUSEKEEPERS,P.H.	0.2244	0.0377	0.7121	0.4936
REGISTERED NURSES	PRACTICAL NURSES	0.2166	0.0147	0.8725	0.4644
SALES REP'S,MFG.	SALES MGRS.,EXC.RETAIL	0.2109	0.0223	0.8087	0.2308
POLICEMEN&DETECTIVES	SHERIFFS,BAILIFFS,ETC.	0.2096	0.0149	0.8671	0.2548
DRAFTSMEN	ARCHITECTS	0.2073	0.0077	0.9286	0.2887
MACHINISTS'	LATHE MACH. OPRTS.	0.2043	0.0150	0.8628	0.2746
ELEMENTARY SCH.TEACHERS	VOC.&ED. COUNSELORS	0.2035	0.0019	0.9813	0.3114
TRUCK DRIVERS	DELIVERYMEN&ROUTEMEN	0.1991	0.0321	0.7223	0.3237
CLERICAL WK'S,N.S.	CLERICAL SUPERVISORS	0.1934	0.0030	0.9692	0.2309
AUTOMOBILE MECHANICS	AUTO BODY REPAIRMEN	0.1903	0.0099	0.9008	0.3077
SECONDARY SCH. TEACHERS	SCH. ADMIN.,ELEM.&SEC.	0.1898	0.0049	0.9496	0.2165
SALES CLERKS, RETAIL	SALES MGRS.,RETAIL	0.1826	0.0064	0.9327	0.2413
COMPUTER PROGRAMMERS	COMPUTER SPECIALISTS	0.1819	0.0198	0.8037	0.2554
SAILORS&DECKHANDS	OFFICERS,ETC.:SHIP	0.1808	0.0120	0.8755	0.2353
TEACHERS, COLLEGE&UNIV.	SCH. ADMIN.,COLLEGE	0.1770	0.0049	0.9458	0.2143
SALES REP'S,WHOLESALE	SALES MGRS.,EXC.RETAIL	0.1706	0.0188	0.8012	0.1867
MINE OPRTS.,N.E.C.	TRANSPORT OPRTS.,N.E.C.	0.1668	0.0065	0.9256	0.2121
RESEARCH WK'S,N.E.C.	PHYSICISTS&ASTRONOMERS	0.1615	0.0031	0.9618	0.3009
COMPOSITORS&TYPESETTERS	PRESSMEN&PLATE PRINTERS	0.1612	0.0392	0.6090	0.2596
SECONDARY SCH. TEACHERS	VOC.&ED. COUNSELORS	0.1588	0.0022	0.9732	0.2430
MACHINISTS	PRECISION MACH. OPRTS.	0.1545	0.0134	0.8407	0.2128
CLERICAL WK'S,N.S.	STATISTICAL CLERKS	0.1519	0.0042	0.9464	0.2577
FISHERMEN&OYSTERMEN	OFFICERS,ETC.:SHIP	0.1506	0.0400	0.5800	0.1961
CLERICAL WK'S,N.S.	BILLING CLERKS	0.1487	0.0026	0.9662	0.3061
RAILROAD SWITCHMEN	RAILROAD CONDUCTORS	0.1419	0.0315	0.6363	0.1642
CONSTRUCTION LABORERS	BRICKMASONS	0.1398	0.0081	0.8909	0.2315
CLERICAL WK'S,N.S.	PAYROLL CLERKS	0.1365	0.0056	0.9215	0.2220
SALES CLERKS, RETAIL	BUYERS,WHOLESALE&RETAIL	0.1364	0.0038	0.9456	0.1716
CONSTRUCTION LABORERS	EXCAVATING MACH. OPER'S	0.1331	0.0117	0.8385	0.1718
SECRETARIES	STENOGRAPHERS	0.1307	0.0138	0.8086	0.3253
REGISTERED NURSES	HEALTH ADMINISTRATORS	0.1290	0.0079	0.8846	0.1679
MGRS.&ADMIN.,SAL.	BUYERS,WHOLESALE&RETAIL	0.1277	0.0066	0.9020	0.1607
ASSEMBLERS	SOLDERERS	0.1246	0.0024	0.9617	0.2589
CARPENTERS&FLOOR LAYERS	CABINETMAKERS	0.1229	0.0123	0.8176	0.1724
TRUCK DRIVERS	DISPATCHERS,VEHICLE	0.1221	0.0024	0.9615	0.1789
CONSTRUCTION LABORERS	CARPENTERS' HELPERS	0.1218	0.0044	0.9297	0.2135
MACHINISTS	MECHANICS,R.R.&CAR SHOP	0.1201	0.0008	0.9862	0.1489
SEWERS&STITCHERS	DRESSMAKERS,EXC.FACTORY	0.1190	0.0038	0.9380	0.2739

Table 7.8 (continued)

Occupation I	Occupation J	R_{IJ}	R_{JI}	D_{IJ}	Adjusted R_{IJ}*
CHEMICAL ENGINEERS	TOOL&DIE MAKERS	0.1188	0.0234	0.6710	0.1706
FARM LABORERS,WAGES.E.	FARMERS	0.1186	0.1133	0.0229	0.2092
MACH. OPRTS.,N.S.	PRECISION MACH. OPRTS.	0.1184	0.0037	0.9394	0.1631
POLICEMEN&DETECTIVES	RADIO OPERATORS	0.1178	0.0037	0.9386	0.1882
CLERICAL WK'S,N.S.	TYPISTS	0.1171	0.0207	0.6998	0.3459
SEWERS&STICHERS	TAILORS	0.1166	0.0055	0.9093	0.2000
TEXTILE OPRTS.,N.E.C.	SPIN'S,TWIST'S,&WIND'S	0.1159	0.0593	0.3229	0.2491
SALES REP'S,MFG.	SALES ENGINEERS	0.1157	0.0070	0.8858	0.1336
SALES REP'S.WHOLESALE	SALES ENGINEERS	0.1157	0.0045	0.9254	0.1336
TEXTILE OPRTS.,N.E.C.	WEAVERS	0.1144	0.0125	0.8024	0.2353
CLERICAL WK'S,N.S.	FILE CLERKS	0.1139	0.0081	0.8666	0.3356
TEXTILE OPRTS.,N.E.C.	DYERS	0.1139	0.0034	0.9417	0.1765
FARMERS	FARM LABORERS,WAGES.E.	0.1133	0.1186	0.0229	0.2825
MINE OPRTS.,N.E.C.	DRILLERS, EARTH	0.1117	0.0163	0.7451	0.1568
DRAFTSMEN	DESIGNERS	0.1103	0.0192	0.7039	0.1608
TRUCK DRIVERS	EXCAVATING MACH. OPER'S	0.1092	0.0108	0.8203	0.1410
COOKS,EXC. P.H.	RESTAURANT,ETC. MGRS.	0.1074	0.0277	0.5903	0.1510
MGRS.&ADMIN.,SAL.	STOCK&BOND SALESMEN	0.1063	0.0034	0.9380	0.1442
SALES CLERKS, RETAIL	PHARMACISTS	0.1060	0.0010	0.9813	0.2400
SEWERS&STICHERS	STATIONARY FIREMEN	0.1058	0.0180	0.7092	0.1327
MGRS.&ADMIN.,SAL.	PURCHASING AGENTS	0.1057	0.0054	0.9033	0.1316
ELEMENTARY SCH.TEACHERS	LIBRARIANS	0.1046	0.0029	0.9465	0.2598
ACCOUNTANTS	BANK OFFICERS&FIN.MGRS.	0.1033	0.0228	0.6388	0.1409
HOUSEKEEPERS,P.H.	COOKS,P.H.	0.1018	0.0116	0.7953	0.1574
EDITORS&REPORTERS	AUTHORS	0.1017	0.0191	0.6840	0.1467
ELEMENTARY SCH.TEACHERS	TEACHERS, COLLEGE&UNIV.	0.1016	0.0055	0.8971	0.2052
MGRS.&ADMIN.,SAL.	PERSONNEL&LAB.REL.WK'S	0.1015	0.0046	0.9133	0.1309
COMPOSITORS&TYPESETTERS	PRINTING CRAFTSMEN,N.S.	0.1014	0.0138	0.7600	0.1636
MGRS.&ADMIN.,SAL.	SALES MGRS.,RETAIL	0.1013	0.0079	0.8555	0.1339
WELDERS&FLAMECUTTERS	BOILERMAKERS	0.1006	0.0067	0.8753	0.1264
MGRS.&ADMIN.,SAL.	SALES MGRS.,EXC.RETAIL	0.1003	0.0145	0.7479	0.1098
SPIN'S,TWIST'S,&WIND'S	WEAVERS	0.1001	0.0149	0.7409	0.2059
MACH. OPRTS.,N.S.	LATHE MACH. OPRTS.	0.0995	0.0021	0.9595	0.1338
CLERICAL WK'S,N.S.	BOOKKEEPERS	0.0994	0.0267	0.5761	0.1962
ELEMENTARY SCH.TEACHERS	ADULT ED. TEACHERS	0.0976	0.0010	0.9805	0.1639
FARMERS	FARM FOREMEN	0.0969	0.0022	0.9553	0.1145
BANK TELLERS	BANK OFFICERS&FIN.MGRS.	0.0949	0.0202	0.6495	0.1294
COMPOSITORS&TYPESETTERS	PROOFREADERS	0.0943	0.0069	0.8634	0.2154
JANITORS&SEXTONS	MILLWRIGHTS	0.0943	0.0005	0.9885	0.1076
BOOKKEEPERS	OFFICE MACHINE:BILLING	0.0938	0.0023	0.9523	0.2111
MGRS.&ADMIN.,SAL.	SCH. ADMIN.,COLLEGE	0.0934	0.0024	0.9497	0.1131
MECHANICS&REPAIRMEN,N.S.	BARBERS	0.0926	0.0086	0.8301	0.1575
MGRS.&ADMIN.,SAL.	SALES REP'S,MFG.	0.0924	0.0162	0.7013	0.1206
TRUCK DRIVERS	BULLDOZER OPERATORS	0.0919	0.0041	0.9151	0.1174
CLERICAL WK'S,N.S.	OFFICE MACHINE:CALC.	0.0904	0.0023	0.9499	0.1778
MGRS.&ADMIN.,SAL.	ADVERTISING AGENTS	0.0900	0.0044	0.9071	0.1281
CLERICAL WK'S,N.S.	OFFICE MGRS.,N.E.C.	0.0893	0.0037	0.9201	0.1087
MGRS.&ADMIN.,SAL.	CHEMICAL ENGINEERS	0.0887	0.0021	0.9541	0.1456
MGRS.&ADMIN.,SAL.	OFFICE MGRS.,N.E.C.	0.0884	0.0064	0.8659	0.1076
MGRS.&ADMIN.,SAL.	SALESMEN, RETAIL	0.0880	0.0173	0.6711	0.1310

*Adjusted to reflect in-movements from occupational status only.

divided by their sum:

$$\text{Coefficient of Flow Hierarchy} = f_{ij} = \left| \frac{p_{ij} - p_{ji}}{p_{ij} + p_{ji}} \right| ,$$

$$\text{Coefficient of Dependence Hierarchy} = d_{ij} = \left| \frac{r_{ij} - r_{ji}}{r_{ij} + r_{ji}} \right| .$$

Both f_{ij} and d_{ij} have theoretical lower and upper bounds of zero and one, respectively. A value close to zero indicates "reciprocity." Mobility coefficients of relatively high magnitude not accompanied by propensities or dependencies for reverse direction movement ("j" to "i") indicate hierarchy.

The "j,i" coefficient is usually substantially less than the "i,j" term: Thus, a hierarchy of manpower flow (recruitment dependence) is indicated for the P-matrix (R-matrix). Although most f_{ij}'s are high, some MI coefficient relationships among the highest of the p_{ij} and r_{ij} elements display relative reciprocity. The two "managers and administrators, n.e.c." categories exemplify relative reciprocity in the P-matrix. "Farm laborers, wage and self-employed" and "Farmers" display substantial reciprocity in the R-matrix (d_{ij} = .02).

Also included in the final column of both tables is the adjusted mobility rate, adjusted to reflect a "movement only" basis of calculation. Thus, while the p_{ij} coefficient for "stenographers" to "secretaries" was equal to twenty percent, this directional movement accounted for almost one-half of "stenographer" job-status changes. An example from the R-matrix is dependence of the "practical nurse" category on "registered nurses": The r_{ij} coefficient is equal to .22. Considering in-movement

to the "practical nurse" category from occupational status only, nearly one-half originated from the "registered nurse" group.

One particularly dominant hierarchical flow pattern evidenced in the rank-ordered p_{ij}'s is movement to the "managers and administrators, salaried" classification. Twenty of 100 highest of these coefficients reflect transition to this category. With its job requirements of organization and supervision talents which develop with maturity and knowledge of business, the managers' group would be expected to be of high career status rank. Such hierarchical patterns of movement, then, conform to occupation system theory expectation. The fact that the retention rate for this group is a relatively low sixty-percent is in keeping with the Broom and Smith notion of career-step hierarchies--"frequent mobility in all directions--upwards, sideways and sometimes downwards."[3] The interaction of the "managers, salaried" with its self-employed or "proprietors" counterpart is evidence of such hierarchies.

Note that very few of the j^{th} categories, excluding the "managers, n.e.c." groups, are "n.e.c." or not-specified (n.s.) types; several i^{th} occupations in the rank ordering are, however. This fact is also indicative of hierarchy to manpower flows--movement from "general" to "specific" categories. Several of the r_{ij} coefficients evince hierarchical dependence. For example, fifteen percent of the recruits to "billing clerks" emigrated from the not-specified clerical worker group.

At this point, the distinction between hierarchy in flow pattern and hierarchy in recruitment dependence should be emphasized. For example, stenographers tend to become secretaries: Twenty percent of

the stenographers in 1965 moved to the "secretary" category. The reverse propensity (secretaries to stenographers) was, however, less than one percent. Yet, movement from the secretarial group accounted for thirteen percent of stenographer recruits! Thus, hierarchical flow and dependence are two quite different concepts. The former is concerned with differential propensities for movement; the latter, differential supply impact of the manpower interchange.

Probably the most significant feature of the large coefficients from both mobility matrices is the relatedness of the occupational pairs. In most instances, there is a clear "situs" similarity in the occupations involved.

Conclusion

From the evidence in this chapter, four major statements on the volume and directional pattern of occupational mobility can be made. They are as follows:

1. The extent of mobility is inversely related to the career status of the occupation. Occupations with low rates of movement (or high rates of retention) are at the end of the career queue (secretaries) or they are so highly specialized that the talents are non-transferable. Occupations with high rates of mobility are low in skill requirements or "youth" oriented. High retention rates are not peculiar to the professional, technical major group although they are characteristic to this group.

2. Occupational movements are a major source of recruits. Entrance rates from non-work status are, however, high

and extremely variable. A high total entrance rate is characteristic of youth and female job categories. Non-professional career hierarchy occupations depend heavily on occupational mobility as a source of recruits and, therefore, tend to have low ENR's. Professional occupations, of course, depend heavily on non-work status entries from category ENR_4.

3. Although there is evidence of structure--substantial propensities for intercategory movement and large recruitment dependencies--in occupational mobility, the facts suggest that the underlying structure is weak. The small coefficients not only dominate the off-diagonal elements of each matrix, they also account for a substantial proportion of total occupational movements.

4. The highly structured mobility patterns indicate hierarchical, as opposed to reciprocal, interrelationships. There is, not surprisingly, a definite career advancement pattern to intercategory flows.

In Appendix B, the retention rate and entrance rates for each of the 304 categories are provided. The occupations are tabled in an order generally consistent with the Census classification codes. Furthermore, these additional features are included: 1. The retention rates are adjusted to include movements to non-work status; 2. the exit rate (EXR, percent moving to non-work status) for each category is presented;

and, 3. the total entrance rate (ENR_T) is given. The high ENR_T and EXR rates for female dominated categories of employment indicate significant interaction with non-work status.

FOOTNOTES

[1]U.S. Bureau of the Census, "Accuracy of Retrospectively Reporting Work Status and Occupation Five Years Ago." p. 2.

[2]R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970): 338-344.

[3]Smith, "The Analysis of Labor Mobility," p. 91.

CHAPTER VIII

EMPIRICAL EVIDENCE: PATTERNS OF MOVEMENT

The major conclusion of this study is that the structure of occupational mobility displays a level of rationality and purposiveness consistent with occupation system theory and the job family hypothesis. This conclusion is based on the evidence contained in this chapter wherein the results of application of the distance model and cluster analysis methodology, discussed in Chapter V, to the P and R matrices are reported. The purpose is to discern the interrelationships between occupations which "unfold" from the mobility data alone; a typology of occupations based solely on patterns of movement is attempted. The only descriptor of each occupation is its own peculiar mobility distribution. Nothing else is used. Although each occupational egressive or ingressive distribution is peculiar, the question is: Which occupations have relatively common mobility patterns? For study of the P-matrix, this question when further specified becomes: Which occupations are in active competition for available openings in other categories of employment? For the R-matrix: Which occupations have common sources of recruits?

Commonality in supply or recruitment is an important mobility factor upon which to base a configuration of occupations, but it is not the only one. Linkages (direct, relatively strong attachments through manpower interchange) is the other. In any given distance metric, the mutual interchange coefficients determine the direct linkages. For example, in the distance metric Pd_{lk}^{cb}, coefficients p_{lk} and p_{kl} are the mutual interchange values. Thus, commonality and mutuality are the two factors in interoccupational mobility comparisons.

The city-block metric was chosen as the primary dissimilarities model because of these important features:

1. Equal Weight: The city-block metric weights each component difference equally, that is, a given component difference ($p_{ik} - p_{jk} = x$, for example) contributes the same amount (x) to the (i,j) distance metric.

2. Theoretical Limits: In conjunction with application of this model to the P-matrix, each resulting distance value has theoretical limits between zero and 2.0. The theoretical lower limit can be obtained, however, only when the retention rates and mutual interchange coefficients all equal a constant ($p_{ii} = p_{ij} = p_{ji} = p_{jj} = .2$, for example) and $p_{ik} = p_{jk}$ for all values of "k," certainly a unique mobility pattern. The upper limit of 2.0 enables one to discern the extent of reduction in potential distance between two categories. For example, a distance of 1.5 would indicate a reduction of 25 percent from the maximum potential distance.

3. Logical Role of Retention Rates: In general, each pair of occupations has a unique base distance defined as the sum of retention rates for the relevant categories. A high retention rate "pushes" the occupation's reference point away from others in the metric space. This seems a logical role for retention rates to play. Occupations with lower retention rates (career status) would tend to be closer to a high retention rate category for two reasons: (1) occupations with lower retention rates have a lower base distance to the

high retention rate categories; and, (2) the considerable out-mobility increases the chances for substantial direct linkages to an occupation with a high retention rate. The linkages must be of sufficient strength to overcome the tendency for the categories with low retention rates to have the lowest base distances. High retention rates are marks of occupations at the end of a career queue. Thus, this feature of the city-block metric is seen as very important. This feature is applicable only to the P-matrix, of course; the ingressive distribution, as specified, has nothing equivalent to a retention rate.

The Euclidean formulation, in relation to the mobility models, was thought to be too strong for, as noted in the previous chapter, most off-diagonal elements are extremely small. Euclidean distance exacerbates this problem: a component difference ($p_{ii} - p_{jk}$, for example) of five percent adds only .0025 to the distance value. The small component differences ineffectively contribute to the distance value; the metrics are dominated, rather than supported, by the retention rates. Tests I have performed indicate this to be the case.[1]

Other specifications of the distance model, particularly Euclidean, have been developed to accentuate mutuality. Principally, the change in specification is manifest through replacement of the diagonal value of the mobility matrix by a constant which is at least as large as the maximum off-diagonal element. All mutual interchange coefficients, then, have an equal comparative base. Through institution of this procedure with the city-block metric, occupations with high out-mobility have large potential

distances with respect to other categories than is the case with high retention rate occupations. The tables are turned: The self-contained categories in the P-matrix have greater potential for clustering. For the R-matrix, the mutuality element, initially ignored, is introduced. With Euclidean specification, the mutual interchange coefficients tend to dominate the distance metrics. Two values are used for the diagonal: (1) the maximum interoccupational mobility coefficient; and, (2) values of one. The ordering of the distance values, unique for the city-block metric, are affected by the value of the constant diagonal for Euclidean specification. In general, the greater the size of the diagonal constant, the greater the accentuation of the mutual interchange coefficients. Eventually, a value is obtained such that the rank order of the distances maps, inversely, one-to-one with the rank order of the sum of mutual interchange coefficients. As the constant value approaches infinity, the distance metrics converge. Hence, the gain in rank order monotonicity obtained through increase of the diagonal reduces the sensitivity of the metric; there is a "trade-off" which must be considered.

In this chapter, only the cluster analysis results of the city-block distance model specification without change of diagonal elements are reported. The diagonal of R is defined as zero and, thus, the mutual interchange components are ignored. This procedure is believed justified because of the wealth of information provided by the ENR categories. Many of the features of primary cluster representations are repeated with the other models, only with varying emphasis.

Cluster Analysis: P-Matrix; City-Block Metric

In Figure 8.1, the cluster representation of P-matrix, city-block space is given. Occupation titles read vertically down the page. There are, of course, 303 cluster levels; thirty-one are reported here: every tenth cluster value and the last. Notice the value of the last cluster. It is the largest interpoint distance in the metric space. As previously acknowledged in reference to the city-block metric application, the value of 2.0 is the maximum theoretical distance.

Before discussing the configuration further, I wish to make one general observation: There is striking correspondence of the cluster solution of Figure 8.1 with the theoretical work of James Scoville on the "job family" model.[2] So much so, in fact, that the cluster results will be interpreted with reference to his work. Scoville's model, offered as an alternative to the Census classification scheme, was discussed in Chapter IV.

Even for the level of disaggregation (certainly extreme) which was employed in this investigation, the cluster results are highly intelligible. The first cluster, although apparently weak by cluster value standards, is obviously related to health technology. Each of these categories has a much higher than average retention rate which increases the base distance. The second broad grouping reflects the Education/Social Welfare families as developed by Scoville. A relatively strong grouping follows: Administrative and Organization coupled with "Salesmen" categories which require considerable knowledge of product: Sales A. Also, many of the important "professional" occupations appear on page one of Figure 8.1.

Figure 8.1

P-Matrix Primary Cluster Configuration

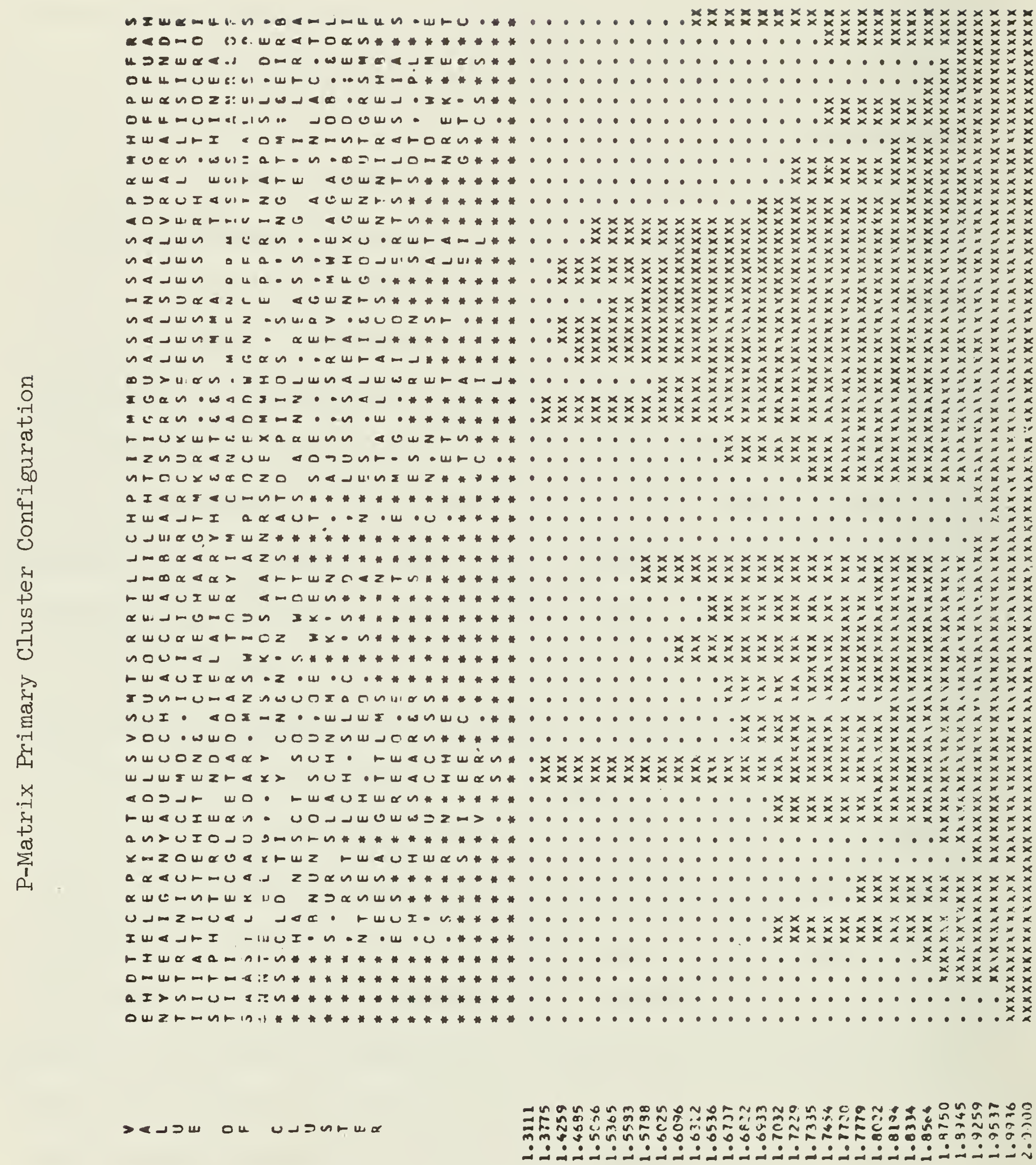


Figure 8.1 (continued)

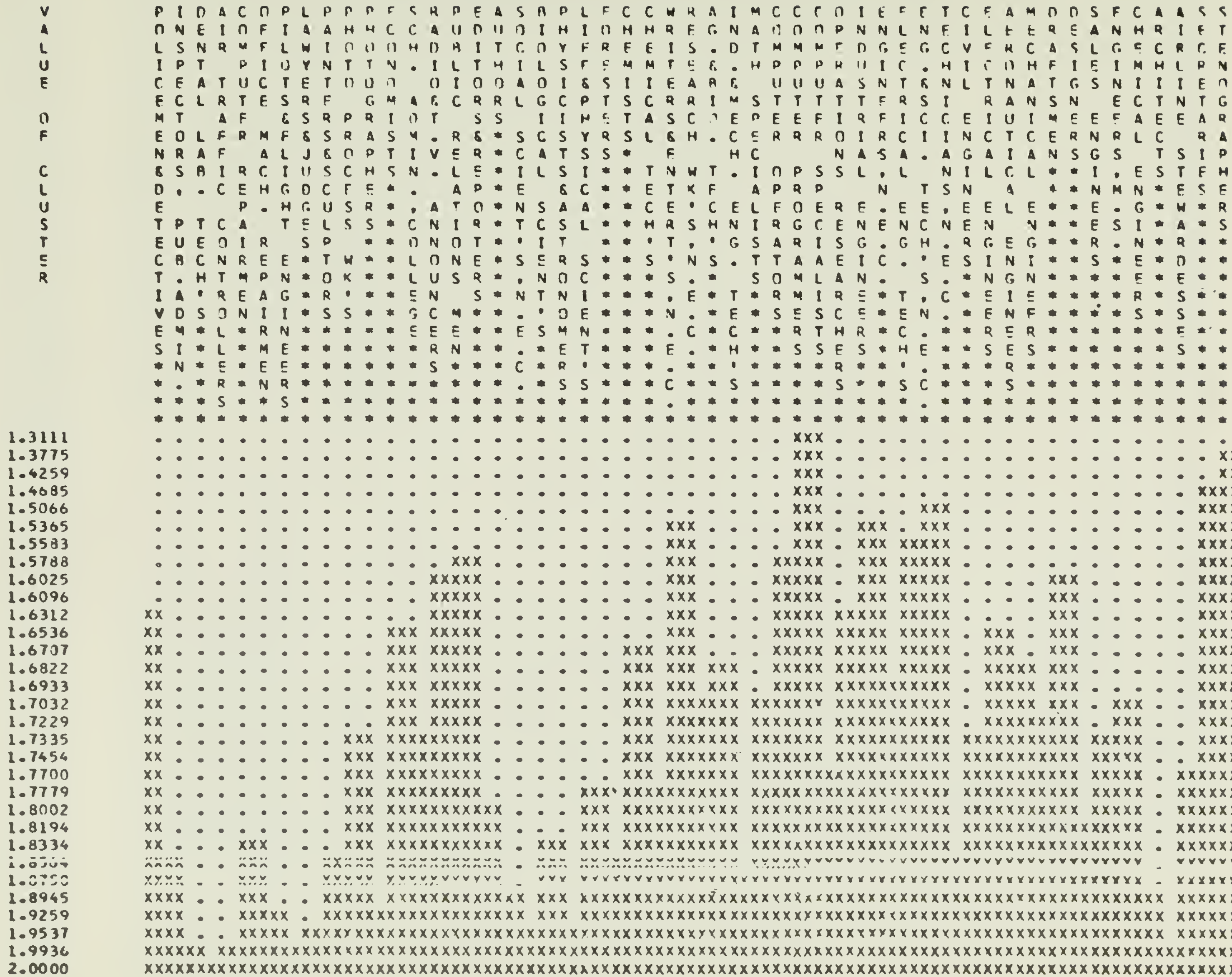


Figure 8.1 (continued)

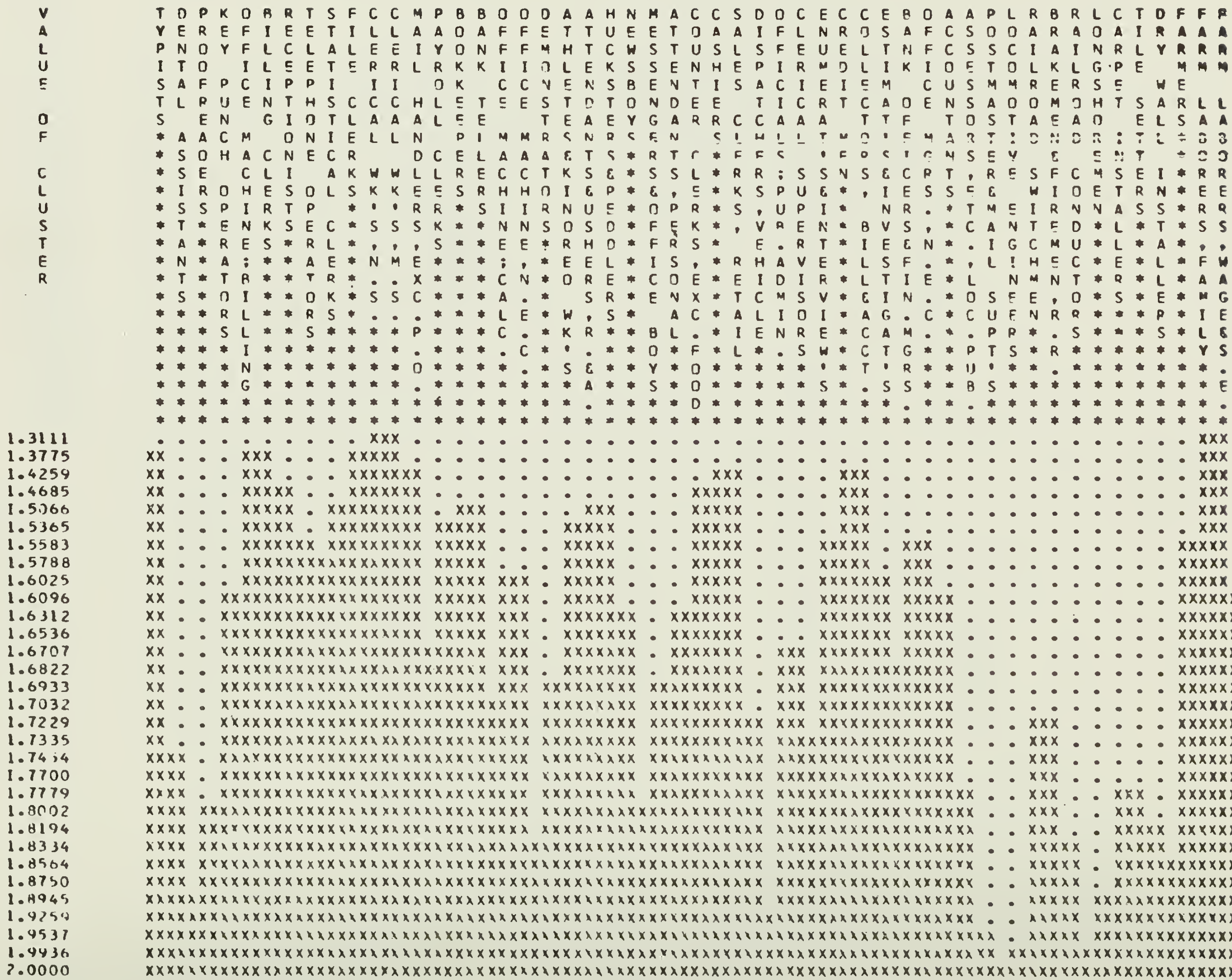


Figure 8.1 (continued)

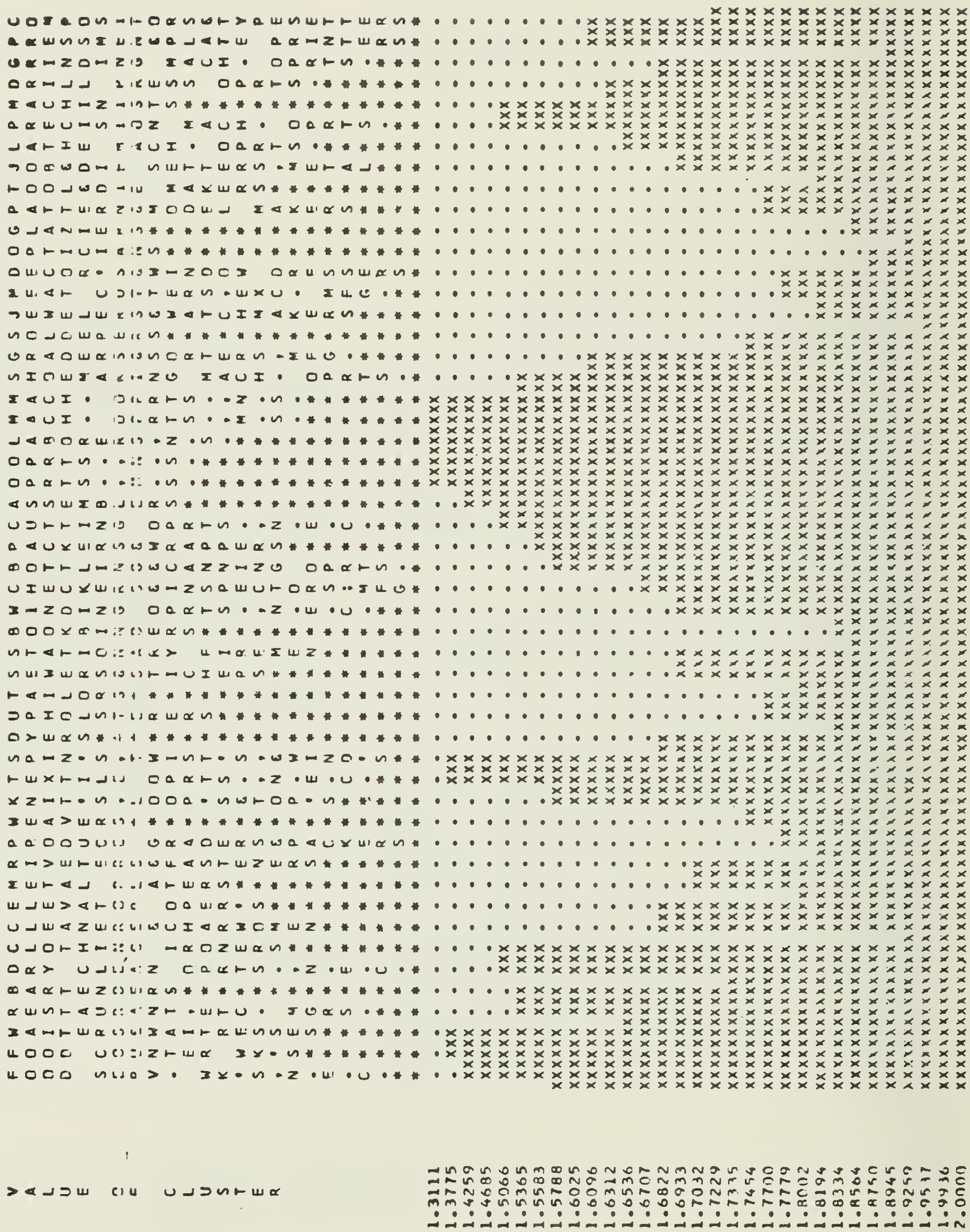
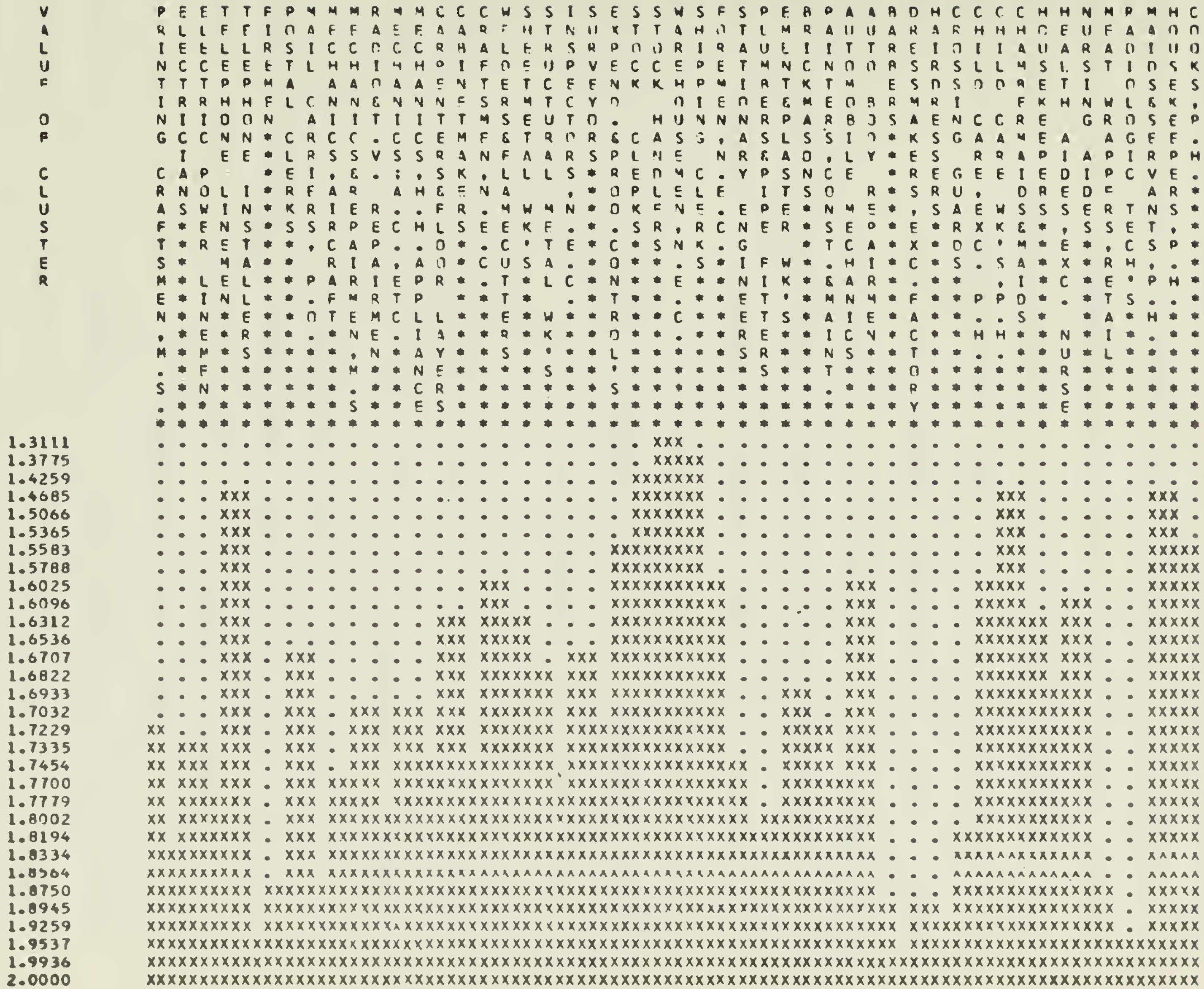


Figure 8.1 (continued)

Figure 8.1 (continued)



On page two of the same figure, the clusters reflect the Scoville job family of Research and Design, broadly and specific lines of situs, narrowly. Job categories of lesser requirements of knowledge and skill are found to be clustered with those of greater content. These clusters evince a definite aura of promotion, transferability, and substitutability. One interesting cluster is the one in which "Economists" and "School Administrators, College" are found with the "public relations" occupation types, a result which is undoubtedly close to the true state of affairs. Secretarial job categories close the second page of the configuration.

This aforementioned grouping is surprisingly disjoint, especially with respect to the broad "clerical" cluster which begins with "Proof-readers" and ends with "Office Machine, n.e.c." in Figure 8.1, page three. The clerical-cluster does have a somewhat narrower technical orientation at its endpoints, however. The not-specified and miscellaneous specified clerical, both of which have relatively low retention rates, are seen as substantially connected with career potential occupations. There are two general "youth-oriented" clusters which follow the broad clerical group. These categories, seemingly, do not have such substantial linkages to career occupations. What might be referred to as a Super-Clerical grouping follows. "Collection, bill and account," a youth occupation by retention rate standards (p_{ii} = .45) which clusters with career status categories, takes on the character of a port-of-entry occupation. A Railroad vehicle operation group and the relatively strong "Farm" occupation cluster which ends with "Farm Foremen" on page four closes this configuration.

The first non-continued cluster in Figure 8.1, page five, exhibits a "tools, specialized" technology, again in conformance with Scoville's theoretical work. This particular cluster seems related to heavy equipment work. Again, a not-specified category of low retention rate has substantial attachment to career status occupations: Mechanics and Repairmen, n.s. (p_{ii} = .35). A very broad cluster of a wide variety of job types follows in which there are more specific situses within. In general, and with possible exceptions at the endpoints, this job cluster represents an unskilled submarket. The broadness of this group and its lack of a distinct technological character dictates this conclusion. A motor vehicle operation category cluster and the beginnings of a food service job family follows.

Job clusters in Figure 8.1, page five, have a general "machines and equipment" technical orientation. There are two relatively specialized clusters: Textile operatives and precision machine; the latter, closely related to Dunlop's job cluster example of the "tool-room."[3] Also, in the middle of this configuration, there is a general title group, machines and equipment, non-specialized, which, incidentally, contains the "Laborers, not-specified" category, another port-of-entry variety. A "printing trades" cluster closes the configuration page.

The job clusters of the first two-thirds of Figure 8.1, page six, represent a variety of specialized skill categories, except for the "stock handling" vocations which, however, evidently have substantial linkages to the skilled worker categories and, probably, particularly to "supervision and inspection" type vocations. A number of specific situses are contained within this broad high-skill content job cluster:

mechanics, skilled construction, metalworking, supervision and inspection. Two service-related job clusters close the entire configuration. The left-most of these is surrounded by female career status (high retention rate) occupations. The three "private household" vocations are seen as isolated. It is noteworthy that the "Maids and Servants" category has a relatively high retention rate of 77 percent. In many respects, this grouping represents a situs/submarket; it is relatively self-contained.

Despite high base distances and general lack of highly structured mobility coefficients, as evidenced in the previous chapter, a surprising and even uncanny cluster configuration was obtained from the P-matrix. The distance model and cluster analysis methodologies appear extremely sensitive. Moreover, the results are a striking conformation of the job family hypothesis. Mobility patterns do appear to be rational and purposive. There are significant linkages of youth-related occupations to career potential or career status occupations. The structure of occupational mobility, although "weak" in many instances, is discernible. Moreover, the results are in accord with occupation system theory. Mobility patterns offer evidence of the existence of submarkets; technology appears to be an underlying force in the creation and further compartmentalization of submarkets along situs lines.

Cluster Analysis: R-Matrix; City-Block Metric

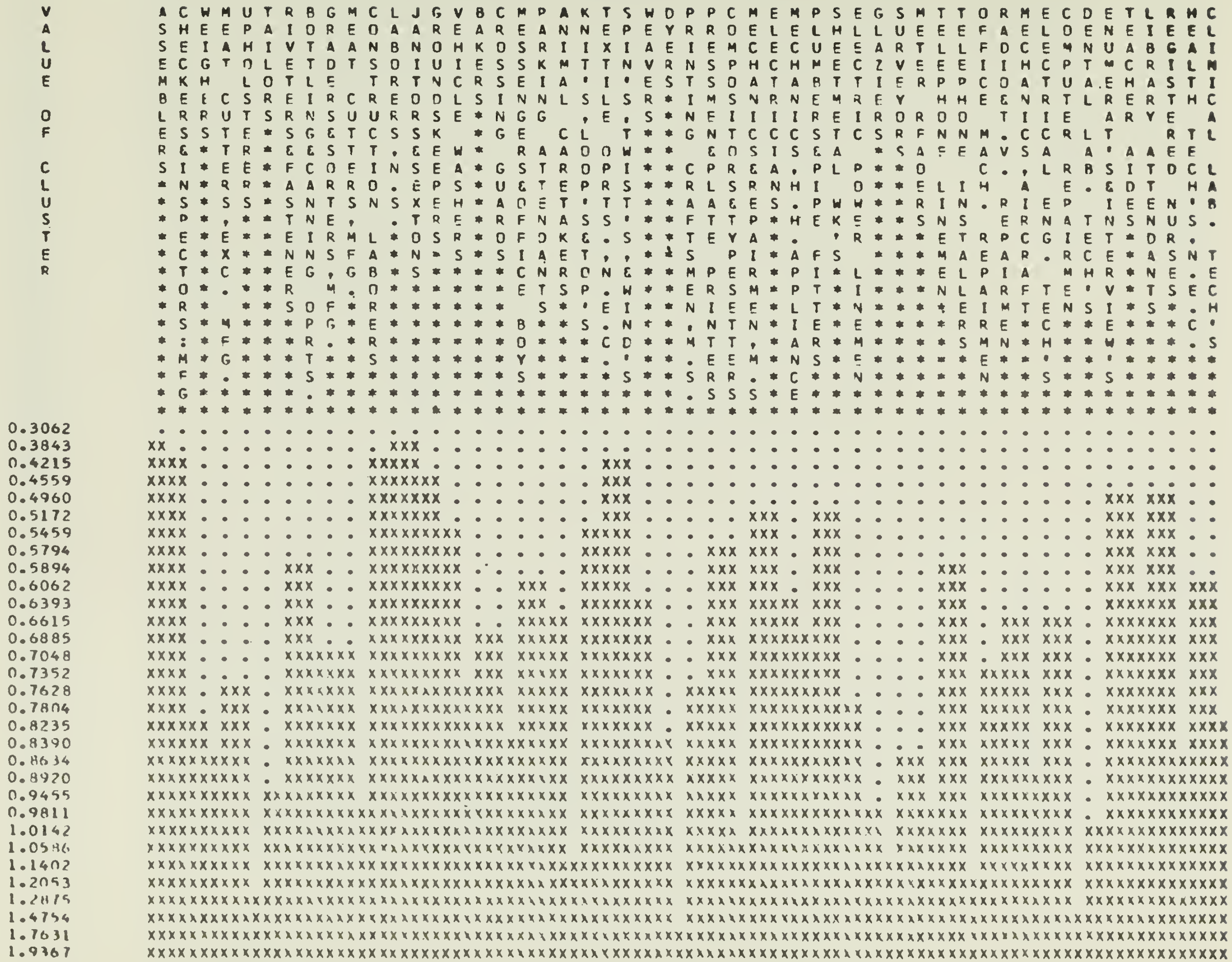
In Figure 8.2, the cluster representation of the R-matrix, city-block distance basis with mutual interchange coefficients excluded, is presented. In this formulation, special emphasis is given to the ENR categories. Occupations which have rather common recruitment dependencies on non-work status of the various categories tend to cluster. Professional

Figure 8.2

R-Matrix Primary Cluster Configuration

Figure 8.2 (continued)

Figure 8.2 (continued)



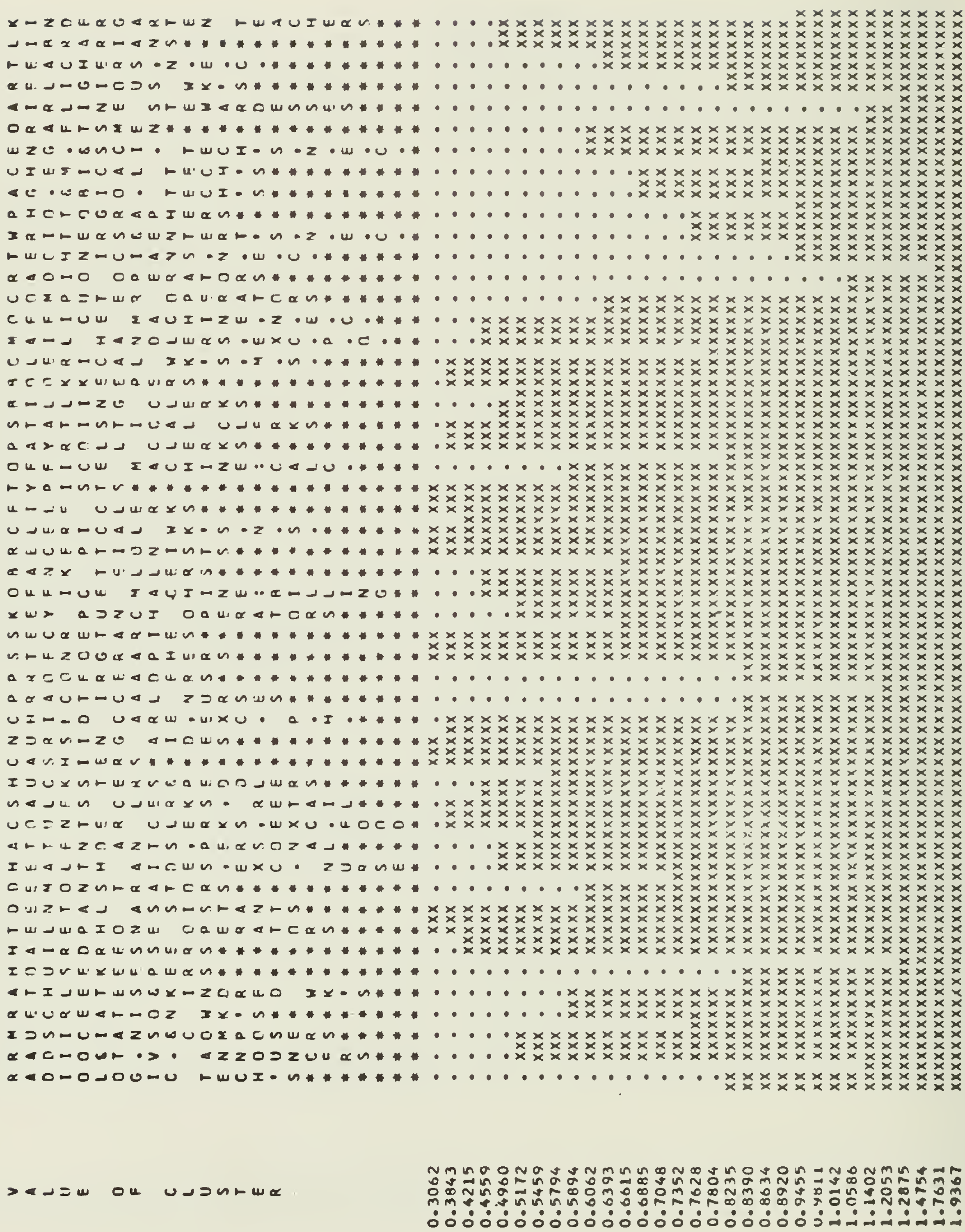


Figure 8.2 (continued)

Figure 8.2 (continued)

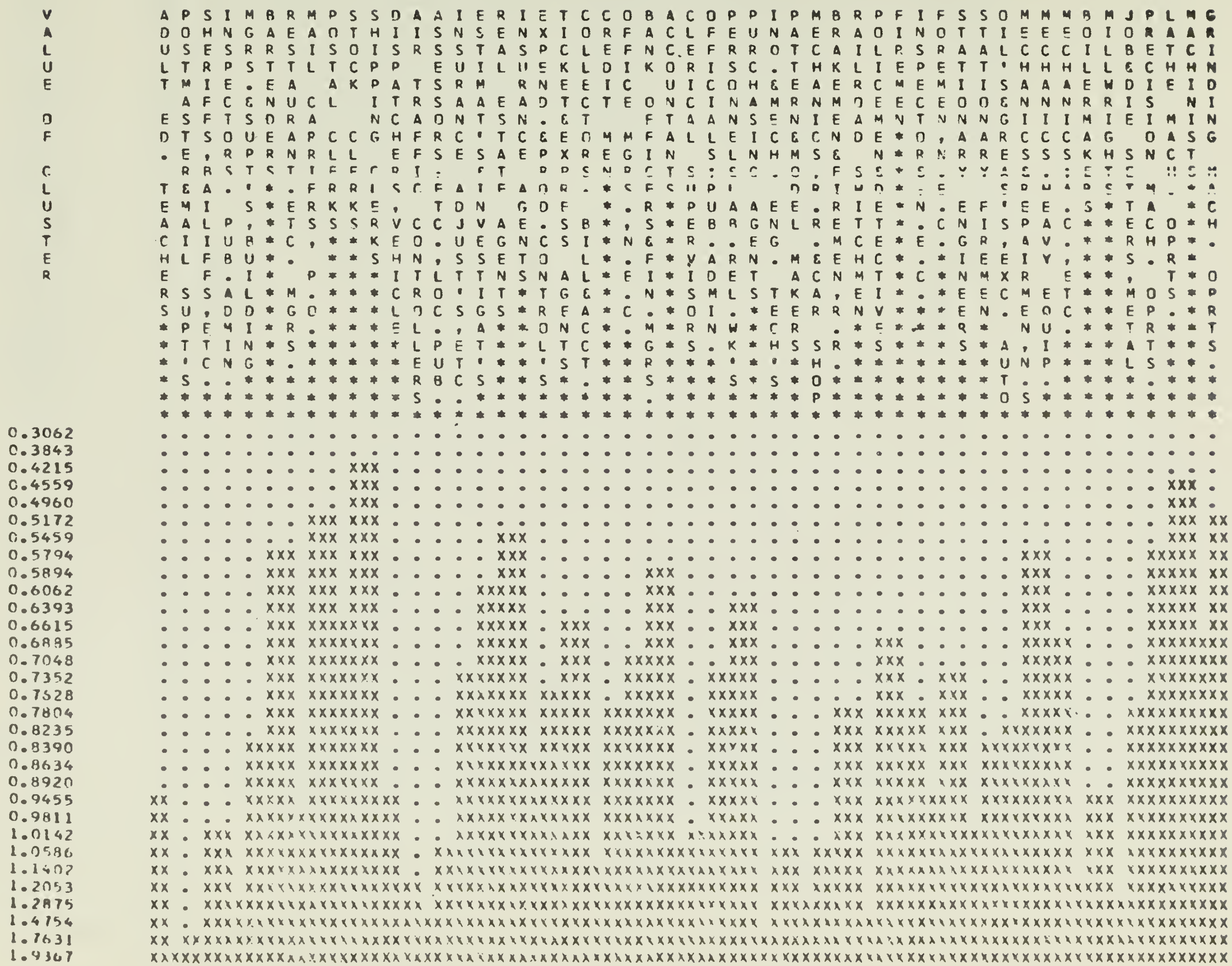


Figure 8.2 (continued)

occupations depend heavily on ENR_4; jobs at the base of the occupational ladder or jobs which are dominated by females tend to have relatively strong ENR's. Occupations which are at the top of the career hierarchy have low ENR's; they tend to remain distinct in the configuration. Thus, level and skew pattern of the ENR categories is an important determinant of the distance metric and cluster configuration. But, certainly, so are the recruitment dependence rates on the occupational (non-ENR) categories. Indeed, for over two-thirds of the occupations, recruitment dependence on occupational mobility was greater than fifty percent.

The results appeal to intuition, although the data does not have as clear of a representation as that in Figure 8.1. Many of the same job clusters are found in both representations, however. In general, the low retention rate categories of the P-matrix do not cluster with their P-matrix partners. This is to be expected. If these categories are youth-oriented, they should draw heavily from non-work status, lower education categories. Out-movements from, not in-movements to, these transition categories exhibit hierarchical attachment to career status jobs. The inescapable conclusion from this R-matrix cluster configuration is, again, the importance of technology.

Supplementary Models: P-Matrix

The remaining models which call for a transformation of the diagonal elements of the P to a constant are presented in Appendix D. First, the city-block with 1's in the main diagonal; then, the Euclidean form with diagonal equal to .2805, the maximum off-diagonal entry. This is followed by the Euclidean form, again with 1's in the main diagonal. This transformation accentuates the mutual interchange coefficients. For example,

a cluster commonly found in these configurations is "Barbers" and "Hairdressers," although the sum of their MI coefficients is only .02. The clusters are generally very narrow at the low values of cluster and quite broad at the higher levels. This seems to indicate substantial direct linkages among a wide variety of jobs. The problem of sensitivity loss due to the Euclidean form with unit diagonal is evident: The difference between highest and lowest distance value is only .24. Further increases in the diagonal would lessen sensitivity in terms of the difference between highest and lowest distance.

Supplementary Models: R-Matrix

Remaining specifications of the distance metric with respect to the R-matrix appear in Appendix D, also. The purpose, as with the above, was to emphasize the MI coefficients. Cluster configurations are generally narrow, initially, and broadly connected in the higher value of cluster ranges.

The "situs" factor as opposed to the "submarket" is accentuated by each of the supplementary specifications, although to varying degrees.

Conclusion

Based solely on occupational mobility data, the evidence appears to be a substantial conformation of the job family hypothesis. This is the unavoidable conclusion from the cluster configurations. Through alternative specifications of the distance model, one can emphasize commonality in distributional flow or highlight mutuality. The various techniques accentuate different features in the data, but do not change

the fundamental conclusion: The structure of occupational mobility displays a level of rationality and purposiveness consistent with occupation system theory and the job family hypothesis.

FOOTNOTES

[1]Cluster Analysis was performed on the P-matrix with diagonal values set at the retention rates, Euclidean distance formulation. From the resulting configurations, it was easily seen that the retention rates were dominating the distance measures. Small, but important mobility coefficients were not given sufficient weight. Thus, I rejected this particular model form.

[2]Scoville, Job Content.

[3]Dunlop, "Wage Theory," p. 129.

CHAPTER IX

SUMMARY AND CONCLUSION

As noted by John Dunlop with reference to the large amounts of empirical data now commonly available to researchers, "The new danger of the period is that we shall be so weighted down and intimidated by unique facts and the complexity of the data that we shall fail to discern boldly general relationships."[1] The large-scale disaggregation used in this study results in an abundance of "unique facts." Yet, "boldly general relationships" are discernible. In general, the findings correspond to Occupation System Theory expectation in terms of the extent and character of occupational mobility.

With respect to the volume of mobility, for example, many occupations exhibit the characteristics of youth-type jobs: low retention rates and relatively high dependence on non-work status as a source of recruits. Female-type occupations display strong interaction with non-work status which can be predicted from their career patterns (greater freedom of substitution of market work, homework, and leisure). Professional occupations have higher than average retention rates and recruit heavily from high quality new entrants. Other career status occupations (foremen, managers) depend on recruits with previous job experience, as would be expected.

With respect to patterns of movement, there is a distinct hierarchical flow (promotion). Movement tends to be from broadly defined, low-skilled job categories to narrowly defined and specialized types. In accordance with labor market structure theory, the empirical

findings suggest the existence of skill-graded submarkets and port-of-entry occupations. The cluster analysis results indicate the influence of technology versus socioeconomic status as a determinant of the structure of occupational mobility. The breadth of the job clusters is, predictably, inversely related to the degree of specialization of the technological form: Specialization is directly opposed to transferability and substitutability. Since there are several technological forms, it is not surprising to see several job clusters. One has the impression that if cross elasticities of supply and elasticities of substitution between all possible pairs of occupations were known (if, indeed, they can even be measured), the results would be congruent, in the main, to those of this study.

For decades, economists have been, rightly, concerned about the degree of structure to occupational movements. Extreme structure implies inflexibility in the supply of labor. With respect to this research question, the empirical results are somewhat mixed. For example, examination of the size distribution of non-zero, off-diagonal coefficients for both the P and R matrices revealed that most of them are quite small. Yet, the fact that over two-thirds of the cells of the count matrix (N) contained not a single sample point is indicative of structure. The several distinctive groupings of occupations basis the cluster methodology also seem indicative of structure, particularly when one considers the large, average base distance of about 1.34 for the primary P-matrix cluster representation. I think the contradiction--small coefficients, yet meaningful clusters--is more apparent than real, however, because the cluster analysis methodology appears extremely

sensitive. Numerous examples could be given of occupations which cluster even though their mutual interchange coefficients are quite small.

Although an interpretation of "degree of structure" must necessarily have an element of subjectivism, I prefer to view the data as exhibiting important facets of "structure," but lacking in "concentratedness." Certainly, occupational movements could be so concentrated that given a particular cluster of occupations, all mobility is internal to the cluster. But this is not the case: Indeed, from the narrowness of the clusters and the small size of the coefficients, it follows that most movements are not internal to the job clusters for all but the very largest values of cluster. This is indicative of flexibility as is the one-third average rate of out-mobility and high dependence on non-work status, low education components as a source of recruits for most all but the professional and career hierarchy occupations. In fact, there are only a few instances where the recruitment dependence of a particular category on another occupational category is greater than the dependence on at least one of the educational components of non-work status. The substantial movements <u>to</u> non-work status also indicate a sizable labor reserve for most categories.

All of this evidence seems to indicate a substantial degree of flexibility of labor supply for most non-professional categories. Of course, one must remember that the time period must be regarded as intermediate in length: Five years is sufficient time to make an engineer out of a high school age newsboy, for example. In the short-run, the important supply interrelationships which are apparent in the data

can be of critical importance in the diminution of shortages of labor of the upper skill grades. Furthermore, it is doubtful that mobility flows will be as dispersed in the short-run.

The evidence indicates the need for further review and refinement of an occupational classification scheme with a technologically oriented job family foundation. It is difficult to measure cross elasticities of supply and elasticities of substitution, directly. Manpower movements between occupations provide an indication of such elasticities, however. Thus, the study of the configuration of occupations which results from mobility patterns is a tool for development of such a classification scheme.

Based on such information a given occupation may be re-evaluated as of either greater or lesser skill. For example, in this investigation, "Bakers," which are classified in the "craftsmen" major group by the Census, appear to be grossly overrated. In terms of both ingressive and egressive distributions, this occupation consistently clusters with occupations which are relatively low in skill. Another example is the "Machinists" classification which is also classified as skilled. This category consistently clusters with the "precision machine operatives" job types which cuts across the Census major group boundaries (contains both "craftsmen" and "operatives" classified categories), as, indeed, is characteristic of many mobility-related occupations. Furthermore, propensities for movement from the so-called "skilled" Machinist class to many of the "precision machine" categories exceed the propensities for reverse flow!

There is, however, one major problem in attempting to construct a classification scheme on such bases. Empirical evidence shows and occupation system theory predicts that the bulk of occupational movements are undertaken by the young. The "age" percentage frequency distribution of the occupationally mobile from a given category is seldom equal to the age profile of all individuals in the occupation--generally, it will have a sharper positive skew. In most job categories, there are varying levels of content. Examination of the ENR's for the "Dietitian" occupational group, for example, reveals substantial new entrance rates for the less than high school and the four-years college components, indicating the existence of two levels of content in that category. The young will be in the lower content levels of the occupation, in general. Thus, their movement patterns determine the cluster position for the relevant category. Consequently, there is probably an understatement of skill levels through employment of mobility job cluster criteria. Yet, this tool certainly has great advantages over ad hoc major group creation. The real opportunity exists for development of an occupational classification system of greater relevance to the research questions of today.

Before closing, I would like to acknowledge the experimental nature of the methodology. No apologies are offered since, in point of fact, cluster analysis and related techniques of multidimensional scaling are relatively new methods of data analysis. One thing is certain: The methodology as developed and employed in this investigation enabled a more in-depth analysis than would otherwise have been possible. While heuristic rather than parametric, it provided a means for identifying

patterns of interrelationship in a huge data matrix which are not discernible by visual inspection. It is a scientifically useful approach to the research question.

FOOTNOTES

[1]Dunlop, "Wage Theory," p. 125.

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APPENDIX A

CENSUS OCCUPATION CODE TRANSFORMATIONS

Appendix A

Census Occupation Code Transformations

Census Code	Census Detailed Title	Transformation Code	Transformation Title
1	ACCOUNTANTS	1	ACCOUNTANTS
2	ARCHITECTS	2	ARCHITECTS
3	COMPUTER PROGRAMMERS	3	COMPUTER PROGRAMMERS
4	COMPUTER SYSTEMS ANALYSTS	4	COMPUTER SPECIALISTS
5	COMPUTER SPECIALISTS, N.E.C.	4	COMPUTER SPECIALISTS
6	AERONAUTICAL AND ASTRONAUTICAL ENGINEERS	5	AERONAUTICAL ENGINEERS
10	CHEMICAL ENGINEERS	6	CHEMICAL ENGINEERS
11	CIVIL ENGINEERS	7	CIVIL ENGINEERS
12	ELECTRICAL AND ELECTRONIC ENGINEERS	8	ELECTRICAL ENGINEERS
13	INDUSTRIAL ENGINEERS	9	INDUSTRIAL ENGINEERS
14	MECHANICAL ENGINEERS	10	MECHANICAL ENGINEERS
15	METALLURGICAL AND MATERIALS ENGINEERS	11	ENGINEERS,M.S.
20	MINING ENGINEERS	11	ENGINEERS,M.S.
21	PETROLEUM ENGINEERS	11	ENGINEERS,M.S.
22	SALES ENGINEERS	12	SALES ENGINEERS
23	ENGINEERS, N.E.C.	13	ENGINEERS,N.E.C.
24	FARM MANAGEMENT ADVISORS	69	RESEARCH WK'S,N.E.C.
25	FORESTERS AND CONSERVATIONISTS	14	FORESTERS
26	HOME MANAGEMENT ADVISORS	69	RESEARCH WK'S,N.E.C.
30	JUDGES	15	LAWYERS&JUDGES
31	LAWYERS	15	LAWYERS&JUDGES
32	LIBRARIANS	16	LIBRARIANS
33	ARCHIVISTS AND CURATORS	16	LIBRARIANS
34	ACTUARIES	17	MATH SPECIALISTS
35	MATHEMATICIANS	17	MATH SPECIALISTS
36	STATISTICIANS	17	MATH SPECIALISTS
42	AGRICULTURAL SCIENTISTS	21	LIFE&PHYSICAL SCIENT'S
43	ATMOSPHERIC AND SPACE SCIENTISTS	21	LIFE&PHYSICAL SCIENT'S
44	BIOLOGICAL SCIENTISTS	18	BIOLOGICAL SCIENT'S
45	CHEMISTS	19	CHEMISTS
51	GEOLOGISTS	21	LIFE&PHYSICAL SCIENT'S
52	MARINE SCIENTISTS	21	LIFE&PHYSICAL SCIENT'S
53	PHYSICISTS AND ASTRONOMERS	20	PHYSICISTS&ASTRONOMERS
54	LIFE AND PHYSICAL SCIENTISTS, N.E.C.	21	LIFE&PHYSICAL SCIENT'S
55	OPERATIONS AND SYSTEMS RESEARCHERS AND ANALYSTS	22	OPERATIONS RESEARCHERS
56	PERSONNEL AND LABOR RELATIONS WORKERS	23	PERSONNEL&LAB.REL.WK'S
61	CHIROPRACTORS	27	HEALTH PRACT.,N.E.C.
62	DENTISTS	24	DENTISTS
63	OPTOMETRISTS	27	HEALTH PRACT.,N.E.C.
64	PHARMACISTS	25	PHARMACISTS
65	PHYSICIANS, MEDICAL AND OSTEOPATHIC	26	PHYSICIANS
71	PODIATRISTS	27	HEALTH PRACT.,N.E.C.
72	VETERINARIANS	27	HEALTH PRACT.,N.E.C.
73	HEALTH PRACTITIONERS, N.E.C.	27	HEALTH PRACT.,N.E.C.
74	DIETITIANS	28	DIETITIANS
75	REGISTERED NURSES	29	REGISTERED NURSES
76	THERAPISTS	30	THERAPISTS
80	CLINICAL LABORATORY TECHNOLOGISTS AND TECHNICIANS	31	CLINICAL LAB. TECH'S
81	DENTAL HYGIENISTS	33	HEALTH TECH'S,N.E.C.
82	HEALTH RECORD TECHNOLOGISTS AND TECHNICIANS	33	HEALTH TECH'S,N.E.C.

Appendix A (continued)

Census Code	Census Detailed Title	Transformation Code	Transformation Title
83	RADIOLOGIC TECHNOLOGISTS AND TECHNICIANS	32	RADIOLOGIC TECH'S
84	THERAPY ASSISTANTS	33	HEALTH TECH'S,N.E.C.
85	HEALTH TECHNOLOGISTS AND TECHNICIANS, N.E.C	33	HEALTH TECH'S,N.E.C.
86	CLERGYMEN	34	CLERGYMEN
90	RELIGIOUS WORKERS, N.E.C.	35	RELIGIOUS WK'S
91	ECONOMISTS	36	ECONOMISTS
92	POLITICAL SCIENTISTS	38	SOCIAL SCIENT'S,N.E.C.
93	PSYCHOLOGISTS	37	PSYCHOLOGISTS
94	SOCIOLOGISTS	38	SOCIAL SCIENT'S,N.E.C.
95	URBAN AND REGIONAL PLANNERS	38	SOCIAL SCIENT'S,N.E.C.
96	SOCIAL SCIENTISTS, N.E.C.	38	SOCIAL SCIENT'S,N.E.C.
100	SOCIAL WORKERS	39	SOCIAL WK'S
101	RECREATION WORKERS	40	RECREATION WK'S
102	AGRICULTURE TEACHERS	41	TEACHERS, COLLEGE&UNIV.
103	ATMOSPHERIC, EARTH, MARINE, AND SPACE TEACHERS	41	TEACHERS, COLLEGE&UNIV.
104	BIOLOGY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
105	CHEMISTRY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
110	PHYSICS TEACHERS	41	TEACHERS, COLLEGE&UNIV.
111	ENGINEERING TEACHERS	41	TEACHERS, COLLEGE&UNIV.
112	MATHEMATICS TEACHERS	41	TEACHERS, COLLEGE&UNIV.
113	HEALTH SPECIALTIES TEACHERS	41	TEACHERS, COLLEGE&UNIV.
114	PSYCHOLOGY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
115	BUSINESS AND COMMERCE TEACHERS	41	TEACHERS, COLLEGE&UNIV.
116	ECONOMICS TEACHERS	41	TEACHERS, COLLEGE&UNIV.
120	HISTORY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
121	SOCIOLOGY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
122	SOCIAL SCIENCE TEACHERS, N.E.C.	41	TEACHERS, COLLEGE&UNIV.
123	ART, DRAMA, AND MUSIC TEACHERS	41	TEACHERS, COLLEGE&UNIV.
124	COACHES AND PHYSICAL EDUCATION TEACHERS	41	TEACHERS, COLLEGE&UNIV.
125	EDUCATION TEACHERS	41	TEACHERS, COLLEGE&UNIV.
126	ENGLISH TEACHERS	41	TEACHERS, COLLEGE&UNIV.
130	FOREIGN LANGUAGE TEACHERS	41	TEACHERS, COLLEGE&UNIV.
131	HOME ECONOMICS TEACHERS	41	TEACHERS, COLLEGE&UNIV.
132	LAW TEACHERS	41	TEACHERS, COLLEGE&UNIV.
133	THEOLOGY TEACHERS	41	TEACHERS, COLLEGE&UNIV.
134	TRADE, INDUSTRIAL, AND TECHNICAL TEACHERS	41	TEACHERS, COLLEGE&UNIV.
135	MISCELLANEOUS TEACHERS, COLLEGE AND UNIVERSITY	41	TEACHERS, COLLEGE&UNIV.
140	TEACHERS, COLLEGE AND UNIVERSITY, SUBJECT NOT SPECIFIED	41	TEACHERS, COLLEGE&UNIV.
141	ADULT EDUCATION TEACHERS	42	ADULT ED. TEACHERS
142	ELEMENTARY SCHOOL TEACHERS	43	ELEMENTARY SCH.TEACHERS
143	PREKINDERGARTEN AND KINDERGARTEN TEACHERS	44	KINDERGARTEN TEACHERS
144	SECONDARY SCHOOL TEACHERS	45	SECONDARY SCH. TEACHERS
145	TEACHERS, EXCEPT COLLEGE AND UNIVERSITY, N.E.C.	46	TEACHERS,N.E.C.
150	AGRICULTURE AND BIOLOGICAL TECHNICIANS, EXCEPT HEALTH	47	AG.&BIO. TECH'S
151	CHEMICAL TECHNICIANS	48	CHEMICAL TECH'S
152	DRAFTSMEN	49	DRAFTSMEN
153	ELECTRICAL AND ELECTRONIC ENGINEERING TECHNICIANS	50	ELECTRICAL ENG. TECH'S
154	INDUSTRIAL ENGINEERING TECHNICIANS	51	IND.&MECH. ENG. TECH'S
155	MECHANICAL ENGINEERING TECHNICIANS	51	IND.&MECH. ENG. TECH'S
156	MATHEMATICAL TECHNICIANS	53	ENG.&SCI. TECH'S,N.E.C.

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161	SURVEYORS	52	SURVEYORS
162	ENGINEERING AND SCIENCE TECHNICIANS, N.E.C.	53	ENG.&SCI. TECH'S,N.E.C.
163	AIRPLANE PILOTS	54	PILOTS&FLIGHT ENGINEERS
164	AIR TRAFFIC CONTROLLERS	55	AIR TRAFFIC CONTROLLERS
165	EMBALMERS	74	FUNERAL DIR.&EMBALMERS
170	FLIGHT ENGINEERS	54	PILOTS&FLIGHT ENGINEERS
171	RADIO OPERATORS	56	RADIO OPERATORS
172	TOOL PROGRAMMERS, NUMERICAL CONTROL	57	TECHNICIANS,N.E.C.
173	TECHNICIANS, N.E.C.	57	TECHNICIANS,N.E.C.
174	VOCATIONAL AND EDUCATIONAL COUNSELORS	58	VOC.&ED. COUNSELORS
175	ACTORS	68	WRITERS&ENTERT'S,N.E.C.
180	ATHLETES AND KINDRED WORKERS	59	ATHLETES&KINDRED WK'S
181	AUTHORS	60	AUTHORS
182	DANCERS	68	WRITERS&ENTERT'S,N.E.C.
183	DESIGNERS	61	DESIGNERS
184	EDITORS AND REPORTERS	62	EDITORS&REPORTERS
185	MUSICIANS AND COMPOSERS	63	MUSICIANS&COMPOSERS
190	PAINTERS AND SCULPTORS	64	PAINTERS&SCULPTORS
191	PHOTOGRAPHERS	65	PHOTOGRAPHERS
192	PUBLIC RELATIONS MEN AND PUBLICITY WRITERS	66	PUBLIC RELATIONS MEN
193	RADIO AND TELEVISION ANNOUNCERS	67	RADIO&T.V. ANNOUNCERS
194	WRITERS, ARTISTS, AND ENTERTAINERS, N.E.C.	68	WRITERS&ENTERT'S,N.E.C.
195	RESEARCH WORKERS, NOT SPECIFIED	69	RESEARCH WK'S,N.E.C.
196	PROFESSIONAL, TECHNICAL, AND KINDRED WORKERS --ALLOCATED		CODE EXCLUDED
201	ASSESSORS, CONTROLLERS, AND TREASURERS; LOCAL PUBLIC ADMINISTRATION	70	ASSESSORS,ETC.,LOC.PUB.
202	BANK OFFICERS AND FINANCIAL MANAGERS	71	BANK OFFICERS&FIN.MGRS.
203	BUYERS AND SHIPPERS, FARM PRODUCTS	83	PURCHASING AGENTS
205	BUYERS, WHOLESALE AND RETAIL TRADE	72	BUYERS,WHOLESALE&RETAIL
210	CREDIT MEN	73	CREDIT MEN
211	FUNERAL DIRECTORS	74	FUNERAL DIR.&EMBALMERS
212	HEALTH ADMINISTRATORS	75	HEALTH ADMINISTRATORS
213	CONSTRUCTION INSPECTORS, PUBLIC ADMINISTRATION	76	INSPECTORS, PUB.ADMIN.
215	INSPECTORS, EXCEPT CONSTRUCTION, PUBLIC ADMINISTRATION	76	INSPECTORS, PUB.ADMIN.
216	MANAGERS AND SUPERINTENDENTS, BUILDING	77	MGRS.&SUPT'S,BUILDING
220	OFFICE MANAGERS, N.E.C.	78	OFFICE MGRS.,N.E.C.
221	OFFICERS, PILOTS, AND PURSERS; SHIP	79	OFFICERS,ETC.;SHIP
222	OFFICIALS AND ADMINISTRATORS; PUBLIC ADMINISTRATION, N.E.C.	80	OFFICIALS;PUB.ADMIN.
223	OFFICIALS OF LODGES, SOCIETIES, AND UNIONS	81	OFFICIALS; LODGES, ETC.
224	POSTMASTERS AND MAIL SUPERINTENDENTS	82	POSTMASTER&MAIL SUPT'S
225	PURCHASING AGENTS AND BUYERS, N.E.C.	83	PURCHASING AGENTS
226	RAILROAD CONDUCTORS	84	RAILROAD CONDUCTORS
230	RESTAURANT, CAFETERIA, AND BAR MANAGERS	85	RESTAURANT,ETC. MGRS.
231	SALES MANAGERS AND DEPARTMENT HEADS, RETAIL TRADE	86	SALES MGRS.,RETAIL
233	SALES MANAGERS, EXCEPT RETAIL TRADE	87	SALES MGRS.,EXC.RETAIL
235	SCHOOL ADMINISTRATORS, COLLEGE	88	SCH. ADMIN.,COLLEGE
240	SCHOOL ADMINISTRATORS, ELEMENTARY AND SECONDARY	89	SCH. ADMIN.,ELEM.&SEC.
245	MANAGERS AND ADMINISTRATORS, N.E.C.	90	MGRS.&ADMIN.,SAL.
246	MANAGERS AND ADMINISTRATORS, EXCEPT FARM-- ALLOCATED		CODE EXCLUDED
260	ADVERTISING AGENTS AND SALESMEN	92	ADVERTISING AGENTS
261	AUCTIONEERS	102	SALESMEN, RETAIL

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Census Code	Census Detailed Title	Transformation Code	Transformation Title
262	DEMONSTRATORS	93	DEMONSTRATORS
264	HUCKSTERS AND PEDDLERS	94	HUCKSTERS&PEDDLERS
265	INSURANCE AGENTS, BROKERS, AND UNDERWRITERS	95	INSURANCE AGENTS
266	NEWSBOYS	96	NEWSBOYS
270	REAL ESTATE AGENTS AND BROKERS	97	REAL ESTATE AGENTS
271	STOCK AND BOND SALESMEN	98	STOCK&BOND SALESMEN
281	SALES REPRESENTATIVES, MANUFACTURING INDUSTRIES	99	SALES REP'S,MFG.
282	SALES REPRESENTATIVES, WHOLESALE TRADE	100	SALES REP'S,WHOLESALE
283	SALES CLERKS, RETAIL TRADE	101	SALES CLERKS, RETAIL
284	SALESMEN, RETAIL TRADE	102	SALESMEN, RETAIL
285	SALESMEN OF SERVICES AND CONSTRUCTION	103	SALESMEN,SERV.&CONST.
296	SALES WORKERS--ALLOCATED		CODE EXCLUDED
301	BANK TELLERS	104	BANK TELLERS
303	BILLING CLERKS	105	BILLING CLERKS
305	BOOKKEEPERS	106	BOOKKEEPERS
310	CASHIERS	107	CASHIERS
311	CLERICAL ASSISTANTS, SOCIAL WELFARE	141	CLERICAL WK'S,M.S.
312	CLERICAL SUPERVISORS, N.E.C.	108	CLERICAL SUPERVISORS
313	COLLECTORS, BILL AND ACCOUNT	109	COLLECTORS, BILL&ACCT.
314	COUNTER CLERKS, EXCEPT FOOD	110	COUNTER CLERKS,EXC.FOOD
315	DISPATCHERS AND STARTERS, VEHICLE	111	DISPATCHERS,VEHICLE
320	ENUMERATORS AND INTERVIEWERS	112	ENUMERAT'S&INTERVIEW'S
321	ESTIMATORS AND INVESTIGATORS, N.E.C.	113	ESTIMAT'S&INVESTIGAT'S
323	EXPEDITERS AND PRODUCTION CONTROLLERS	114	EXPEND.&PROD.CONTROL'S
325	FILE CLERKS	115	FILE CLERKS
326	INSURANCE ADJUSTERS, EXAMINERS, AND INVESTIGATORS	116	INSURANCE ADJUST'S,ETC.
330	LIBRARY ATTENDANTS AND ASSISTANTS	117	LIBRARY ATTENDANTS
331	MAIL CARRIERS, POST OFFICE	118	MAIL CARRIERS, P.O.
332	MAIL HANDLERS, EXCEPT POST OFFICE	119	MAIL HANDLERS,EXC.P.O.
333	MESSENGERS AND OFFICE BOYS	120	MESSENGERS&OFFICE BOYS
334	METER READERS, UTILITIES	121	METER READERS
341	BOOKKEEPING AND BILLING MACHINE OPERATORS	122	OFFICE MACHINE;BILLING
342	CALCULATING MACHINE OPERATORS	123	OFFICE MACHINE;CALC.
343	COMPUTER AND PERIPHERAL EQUIPMENT OPERATORS	124	COMPUTER OPERATORS
344	DUPLICATING MACHINE OPERATORS	126	OFFICE MACHINE,N.E.C.
345	KEY PUNCH OPERATORS	125	KEY PUNCH OPERATORS
350	TABULATING MACHINE OPERATORS	123	OFFICE MACHINE;CALC.
355	OFFICE MACHINE OPERATORS, N.E.C.	126	OFFICE MACHINE,N.E.C.
360	PAYROLL AND TIMEKEEPING CLERKS	127	PAYROLL CLERKS
361	POSTAL CLERKS	128	POSTAL CLERKS
362	PROOFREADERS	129	PROOFREADERS
363	REAL ESTATE APPRAISERS	113	ESTIMAT'S&INVESTIGAT'S
364	RECEPTIONISTS	130	RECEPTIONISTS
370	SECRETARIES, LEGAL	131	SECRETARIES
371	SECRETARIES, MEDICAL	131	SECRETARIES
372	SECRETARIES, N.E.C.	131	SECRETARIES
374	SHIPPING AND RECEIVING CLERKS	132	SHIPPING CLERKS
375	STATISTICAL CLERKS	133	STATISTICAL CLERKS
376	STENOGRAPHERS	134	STENOGRAPHERS
381	STOCK CLERKS AND STOREKEEPERS	135	STOCK CLERKS

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382	TEACHER AIDES, EXC. SCHOOL MONITORS	136	TEACHER AIDES
383	TELEGRAPH MESSENGERS	120	MESSENGERS&OFFICE BOYS
384	TELEGRAPH OPERATORS	128	POSTAL CLERKS
385	TELEPHONE OPERATORS	137	TELEPHONE OPERATORS
390	TICKET, STATION, AND EXPRESS AGENTS	138	TICKET&EXPRESS AGENTS
391	TYPISTS	139	TYPISTS
392	WEIGHERS	140	WEIGHERS
394	MISCELLANEOUS CLERICAL WORKERS	141	CLERICAL WK'S,M.S.
395	NOT SPECIFIED CLERICAL WORKERS	142	CLERICAL WK'S,N.S.
396	CLERICAL AND KINDRED WORKERS --ALLOCATED		CODE EXCLUDED
401	AUTOMOBILE ACCESSORIES INSTALLERS	172	AUTOMOBILE MECHANICS
402	BAKERS	143	BAKERS
403	BLACKSMITHS	144	METAL CRAFTSMEN,M.S.
404	BOILERMAKERS	145	BOILERMAKERS
405	BOOKBINDERS	146	BOOKBINDERS
410	BRICKMASONS AND STONEMASONS	147	BRICKMASONS
411	BRICKMASONS AND STONEMASONS, APPRENTICES	147	BRICKMASONS
412	BULLDOZER OPERATORS	148	BULLDOZER OPERATORS
413	CABINETMAKERS	149	CABINETMAKERS
415	CARPENTERS	150	CARPENTERS&FLOOR LAYERS
416	CARPENTER APPRENTICES	150	CARPENTERS&FLOOR LAYERS
420	CARPET INSTALLERS	151	CARPET INSTALLERS
421	CEMENT AND CONCRETE FINISHERS	152	CEMENT&PLASTER WK'S
422	COMPOSITORS AND TYPESETTERS	153	COMPOSITORS&TYPESETTERS
423	PRINTING TRADES APPRENTICES, EXC. PRESSMEN	153	COMPOSITORS&TYPESETTERS
424	CRANEMEN, DERRICKMEN, AND HOISTMEN	154	CRANEMEN&DERRICKMEN
425	DECORATORS AND WINDOW DRESSERS	155	DECOR'S&WINDOW DRESSERS
426	DENTAL LABORATORY TECHNICIANS	156	DENTAL LAB. TECH'S
430	ELECTRICIANS	157	ELECTRICIANS
431	ELECTRICIAN APPRENTICES	157	ELECTRICIANS
433	ELECTRIC POWER LINEMEN AND CABLEMEN	158	ELECTRIC POWER LINEMEN
434	ELECTROTYPERS AND STEREOTYPERS	159	PRINTING CRAFTSMEN,M.S.
435	ENGRAVERS, EXC. PHOTOENGRAVERS	153	COMPOSITORS&TYPESETTERS
436	EXCAVATING, GRADING, AND ROAD MACHINE OPERATORS; EXC. BULLDOZER	160	EXCAVATING MACH. OPER'S
440	FLOOR LAYERS, EXC. TILE SETTERS	150	CARPENTERS&FLOOR LAYERS
441	FOREMEN, N.E.C.	161	FOREMEN,N.E.C.
442	FORGEMEN AND HAMMERMEN	144	METAL CRAFTSMEN,M.S.
443	FURNITURE AND WOOD FINISHERS	223	PAINTERS,MFG. ARTICLES
444	FURRIERS	198	CRAFTSMEN,N.E.C.
445	GLAZIERS	162	GLAZIERS
446	HEAT TREATERS, ANNEALERS, AND TEMPERERS	168	MACHINISTS
450	INSPECTORS, SCALERS, AND GRADERS; LOG AND LUMBER	163	INSPECTORS,N.E.C.
452	INSPECTORS, N.E.C.	163	INSPECTORS,N.E.C.
453	JEWELERS AND WATCHMAKERS	164	JEWELERS&WATCHMAKERS
454	JOB AND DIE SETTERS, METAL	165	JOB&DIE SETTERS,METAL
455	LOCOMOTIVE ENGINEERS	166	LOCOMOTIVE ENGINEERS
456	LOCOMOTIVE FIREMEN	167	BRAKEMEN&FIREMEN,R.R.
461	MACHINISTS	168	MACHINISTS
462	MACHINIST APPRENTICES	168	MACHINISTS
470	AIR CONDITIONING, HEATING, AND REFRIGERATION	169	MECHANICS;A.C.,ETC.

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471	AIRCRAFT	170	MECHANICS,AIRCRAFT
472	AUTOMOBILE BODY REPAIRMEN	171	AUTO BODY REPAIRMEN
473	AUTOMOBILE MECHANICS	172	AUTOMOBILE MECHANICS
474	AUTOMOBILE MECHANIC APPRENTICES	172	AUTOMOBILE MECHANICS
475	DATA PROCESSING MACHINE REPAIRMEN	173	COMPUTER REPAIRMEN
480	FARM IMPLEMENT	174	MECHANICS,FARM IMP.
481	HEAVY EQUIPMENT MECHANICS, INCL. DIESEL	175	MECHANICS,HEAVY EQUIP.
482	HOUSEHOLD APPLIANCE AND ACCESSORY INSTALLERS AND MECHANICS	176	MECHANICS,H.H.APPLIANCE
483	LOOM FIXERS	180	MECHANICS&REPAIRMEN,M.S
484	OFFICE MACHINE	177	OFFICE MACH. REPAIRMEN
485	RADIO AND TELEVISION	178	RADIO&T.V. REPAIRMEN
486	RAILROAD AND CAR SHOP	179	MECHANICS,R.R.&CAR SHOP
491	MECHANIC, EXC. AUTO, APPRENTICES	180	MECHANICS&REPAIRMEN,M.S
492	MISCELLANEOUS MECHANICS AND REPAIRMEN	180	MECHANICS&REPAIRMEN,M.S
495	NOT SPECIFIED MECHANICS AND REPAIRMEN	181	MECHANICS&REPAIRMEN,N.S
501	MILLERS; GRAIN, FLOUR, AND FEED	198	CRAFTSMEN,N.E.C.
502	MILLWRIGHTS	182	MILLWRIGHTS
503	MOLDERS, METAL	144	METAL CRAFTSMEN,M.S.
504	MOLDER APPRENTICES	144	METAL CRAFTSMEN,M.S.
505	MOTION PICTURE PROJECTIONISTS	198	CRAFTSMEN,N.E.C.
506	OPTICIANS, AND LENS GRINDERS AND POLISHERS	183	OPTICIANS
510	PAINTERS, CONSTRUCTION AND MAINTENANCE	184	PAINTERS,CONST.&MAINT.
511	PAINTER APPRENTICES	184	PAINTERS,CONST.&MAINT.
512	PAPERHANGERS	184	PAINTERS,CONST.&MAINT.
514	PATTERN AND MODEL MAKERS, EXC. PAPER	185	PATTERN&MODEL MAKERS
515	PHOTOENGRAVERS AND LITHOGRAPHERS	159	PRINTING CRAFTSMEN,M.S.
516	PIANO AND ORGAN TUNERS AND REPAIRMEN	198	CRAFTSMEN,N.E.C.
520	PLASTERERS	152	CEMENT&PLASTER WK'S
521	PLASTERER APPRENTICES	152	CEMENT&PLASTER WK'S
522	PLUMBERS AND PIPE FITTERS	186	PLUMBERS&PIPE FITTERS
523	PLUMBER AND PIPE FITTER APPRENTICES	186	PLUMBERS&PIPE FITTERS
525	POWER STATION OPERATORS	198	CRAFTSMEN,N.E.C.
530	PRESSMEN AND PLATE PRINTERS, PRINTING	187	PRESSMEN&PLATE PRINTERS
531	PRESSMAN APPRENTICES	187	PRESSMEN&PLATE PRINTERS
533	ROLLERS AND FINISHERS, METAL	144	METAL CRAFTSMEN,M.S.
534	ROOFERS AND SLATERS	188	ROFFERS&SLATERS
535	SHEETMETAL WORKERS AND TINSMITHS	189	SHEETMETAL WK'S
536	SHEETMETAL APPRENTICES	189	SHEETMETAL WK'S
540	SHIPFITTERS	191	STRUCTURAL METAL WK'S
542	SHOE REPAIRMEN	198	CRAFTSMEN,N.E.C.
543	SIGN PAINTERS AND LETTERERS	198	CRAFTSMEN,N.E.C.
545	STATIONARY ENGINEERS	190	STATIONARY ENGINEERS
546	STONE CUTTERS AND STONE CARVERS	198	CRAFTSMEN,N.E.C.
550	STRUCTURAL METAL CRAFTSMEN	191	STRUCTURAL METAL WK'S
551	TAILORS	192	TAILORS
552	TELEPHONE INSTALLERS AND REPAIRMEN	193	TELEPHONE INSTALLERS
554	TELEPHONE LINEMEN AND SPLICERS	194	TELEPHONE LINEMEN
560	TILE SETTERS	195	TILE SETTERS
561	TOOL AND DIE MAKERS	196	TOOL&DIE MAKERS
562	TOOL AND DIE MAKER APPRENTICES	196	TOOL&DIE MAKERS

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563	UPHOLSTERERS	197	UPHOLSTERERS
571	SPECIFIED CRAFT APPRENTICES, N.E.C.	198	CRAFTSMEN,N.E.C.
572	NOT SPECIFIED APPRENTICES	198	CRAFTSMEN,N.E.C.
575	CRAFTSMEN AND KINDRED WORKERS, N.E.C.	198	CRAFTSMEN,N.E.C.
580	FORMER MEMBERS OF THE ARMED FORCES		CODE EXCLUDED
586	CRAFTSMEN AND KINDRED WORKERS--ALLOCATED		CODE EXCLUDED
601	ASBESTOS AND INSULATION WORKERS	199	ASPESTOS WK'S
602	ASSEMBLERS	200	ASSEMBLERS
603	BLASTERS AND POWDERMEN	245	OPRTS.,M.S.
604	BOTTLING AND CANNING OPERATIVES	201	BOTTLING&CANNING OPRTS.
605	CHAINMEN, RODMEN, AND AXMEN; SURVEYING	245	OPRTS.,M.S.
610	CHECKERS, EXAMINERS, AND INSPECTORS, MANUFACTURING	202	CHECKERS&INSPECTORS;MFG
611	CLOTHING IRONERS AND PRESSERS	203	CLOTHING IRONERS
612	CUTTING OPERATIVES, N.E.C.	204	CUTTING OPRTS.,N.E.C.
613	DRESSMAKERS AND SEAMSTRESSES, EXCEPT FACTORY	205	DRESSMAKERS,EXC.FACTORY
614	DRILLERS, EARTH	206	DRILLERS, EARTH
615	DRY WALL INSTALLERS AND LATHERS	207	DRY WALL INSTALLERS
620	DYERS	208	DYERS
621	FILERS, POLISHERS, SANDERS, AND BUFFERS	209	FILERS,POLISHERS,ETC.
622	FURNACEMEN, SMELTERMEN, AND POURERS	210	HEATERS&FURNACEMEN
623	GARAGE WORKERS AND GAS STATION ATTENDANTS	211	GARAGE WK'S
624	GRADERS AND SORTERS, MANUFACTURING	212	GRADERS&SORTERS,MFG.
625	PRODUCE GRADERS AND PACKERS, EXCEPT FACTORY AND FARM	213	PRODUCE GRADERS&PACKERS
626	HEATERS, METAL	210	HEATERS&FURNACEMEN
630	LAUNDRY AND DRY CLEANING OPERATIVES, N.E.C.	214	DRY CLEAN OPRTS.,N.E.C.
631	MEAT CUTTERS AND BUTCHERS, EXC. MANUFACTURING	215	MEAT CUTTERS,EXC. MFG.
633	MEAT CUTTERS AND BUTCHERS, MANUFACTURING	216	MEAT CUTTERS,MFG.
634	MEAT WRAPPERS, RETAIL TRADE	217	MEAT WRAPPERS,RETAIL
635	METAL PLATERS	218	METAL PLATERS
636	MILLINERS	245	OPRTS.,M.S.
640	MINE OPERATIVES, N.E.C.	219	MINE OPRTS.,N.E.C.
641	MIXING OPERATIVES	220	MIXING OPRTS.
642	OILERS AND GREASERS, EXC. AUTO	221	OIL'S&GREAS'S,EXC. AUTO
643	PACKERS AND WRAPPERS, EXCEPT MEAT AND PRODUCE	222	PACKERS&WRAPPERS
644	PAINTERS, MANUFACTURED ARTICLES	223	PAINTERS,MFG. ARTICLES
645	PHOTOGRAPHIC PROCESS WORKERS	224	PHOTO PROCESS WK'S
650	DRILL PRESS OPERATIVES	225	DRILL PRESS OPRTS.
651	GRINDING MACHINE OPERATIVES	226	GRINDING MACH. OPRTS.
652	LATHE AND MILLING MACHINE OPERATIVES	227	LATHE MACH. OPRTS.
653	PRECISION MACHINE OPERATIVES, N.E.C.	228	PRECISION MACH. OPRTS.
656	PUNCH AND STAMPING PRESS OPERATIVES	229	PUNCH PRESS OPRTS.
660	RIVETERS AND FASTENERS	230	RIVETERS&FASTENERS
661	SAILORS AND DECKHANDS	231	SAILORS&DECKHANDS
662	SAWYERS	232	SAWYERS
663	SEWERS AND STITCHERS	233	SEWERS&STICHERS
664	SHOEMAKING MACHINE OPERATIVES	234	SHOEMAKING MACH. OPRTS.
665	SOLDERERS	235	SOLDERERS
666	STATIONARY FIREMEN	236	STATIONARY FIREMEN
670	CARDING, LAPPING, AND COMBING OPERATIVES	240	TEXTILE OPRTS.,N.E.C.
671	KNITTERS, LOOPERS, AND TOPPERS	237	KNIT'S,LOOP'S&TOP'S

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672	SPINNERS, TWISTERS, AND WINDERS	238	SPIN'S,TWIST'S,&WIND'S
673	WEAVERS	239	WEAVERS
674	TEXTILE OPERATIVES, N.E.C.	240	TEXTILE OPRTS.,N.E.C.
680	WELDERS AND FLAME-CUTTERS	241	WELDERS&FLAMECUTTERS
681	WINDING OPERATIVES, N.E.C.	242	WINDING OPRTS.,N.E.C.
690	MACHINE OPERATIVES, MISCELLANEOUS SPECIFIED	243	MACH. OPRTS.,M.S.
692	MACHINE OPERATIVES, NOT SPECIFIED	244	MACH. OPRTS.,N.S.
694	MISCELLANEOUS OPERATIVES	245	OPRTS.,M.S.
695	NOT SPECIFIED OPERATIVES	246	OPRTS.,N.S.
696	OPERATIVES, EXCEPT TRANSPORT--ALLOCATED		CODE EXCLUDED
701	BOATMEN AND CANALMEN	254	TRANSPORT OPRTS.,N.E.C.
703	BUS DRIVERS	247	BUS DRIVERS
704	CONDUCTORS AND MOTORMEN, URBAN RAIL TRANSIT	254	TRANSPORT OPRTS.,N.E.C.
705	DELIVERYMEN AND ROUTEMEN	248	DELIVERYMEN&ROUTEMEN
706	FORK LIFT AND TOW MOTOR OPERATIVES	249	LIFT&TOW MOTOR OPRTS.
710	MOTORMEN: MINE, FACTORY, LOGGING CAMP, ETC.	254	TRANSPORT OPRTS.,N.E.C.
711	PARKING ATTENDANTS	250	PARKING ATTENDANTS
712	RAILROAD BRAKEMEN	167	BRAKEMEN&FIREMEN,R.R.
713	RAILROAD SWITCHMEN	251	RAILROAD SWITCHMEN
714	TAXICAB DRIVERS AND CHAUFFEURS	252	TAXICAB DRIVERS
715	TRUCK DRIVERS	253	TRUCK DRIVERS
726	TRANSPORT EQUIPMENT OPERATIVES--ALLOCATED	310	CODE EXCLUDED
740	ANIMAL CARETAKERS, EXC. FARM	255	ANIMAL CARETAKERS
750	CARPENTERS' HELPERS	256	CARPENTERS' HELPERS
751	CONSTRUCTION LABORERS, EXC. CARPENTERS' HELPERS	257	CONSTRUCTION LABORERS
752	FISHERMEN AND OYSTERMEN	258	FISHERMEN&OYSTERMEN
753	FREIGHT AND MATERIAL HANDLERS	259	FREIGHT HANDLERS
754	GARBAGE COLLECTORS	260	GARBAGE COLLECTORS
755	GARDENERS AND GROUNDSKEEPERS, EXC. FARM	261	GROUNDSKEEPERS
760	LONGSHOREMEN AND STEVEDORES	262	LONGSHOREMEN
761	LUMBERMEN, RAFTSMEN, AND WOODCHOPPERS	263	LUMBERMEN
762	STOCKHANDLERS	264	STOCK HANDLERS
763	TEAMSTERS	267	LABORERS,M.S.
764	VEHICLE WASHERS AND EQUIPMENT CLEANERS	265	VEHICLE WASHERS
770	WAREHOUSEMEN, N.E.C.	266	WAREHOUSEMEN,N.E.C.
780	MISCELLANEOUS LABORERS	267	LABORERS,M.S.
785	NOT SPECIFIED LABORERS	268	LABORERS,N.S.
796	LABORERS, EXCEPT FARM--ALLOCATED		CODE EXCLUDED
801	FARMERS (OWNERS AND TENANTS)	269	FARMERS
802	FARM MANAGERS	270	FARM MANAGERS
806	FARMERS AND FARM MANAGERS--ALLOCATED		CODE EXCLUDED
821	FARM FOREMEN	271	FARM FOREMEN
822	FARM LABORERS, WAGE WORKERS	272	FARM LABORERS,WAGE&S.E.
823	FARM LABORERS, UNPAID FAMILY WORKERS	273	FARM LABORERS,FAMILY
824	FARM SERVICE LABORERS, SELF-EMPLOYED	272	FARM LABORERS,WAGE&S.E.
844	FARM LABORERS AND FARM FOREMEN--ALLOCATED		CODE EXCLUDED
901	CHAMBERMAIDS AND MAIDS, EXCEPT PRIVATE HOUSEHOLD	274	CHAMBERMAIDS&MAIDS
902	CLEANERS AND CHARWOMEN	275	CLEANERS&CHARWOMEN
903	JANITORS AND SEXTONS	276	JANITORS&SEXTONS
910	BARTENDERS	277	BARTENDERS

Appendix A (continued)

Census Code	Census Detailed Title	Transformation Code	Transformation Title
911	BUSBOYS	278	BUSBOYS
912	COOKS, EXCEPT PRIVATE HOUSEHOLD	279	COOKS,EXC. P.H.
913	DISHWASHERS	280	DISHWASHERS
914	FOOD COUNTER AND FOUNTAIN WORKERS	281	FOOD COUNTER WK'S
915	WAITERS	282	WAITERS&WAITRESSES
916	FOOD SERVICE WORKERS, N.E.C., EXCEPT PRIVATE HOUSEHOLD	283	FOOD SERV. WK'S,N.E.C.
921	DENTAL ASSISTANTS	284	DENTAL ASSISTANTS
922	HEALTH AIDES, EXC. NURSING	285	HEALTH AIDES,EXC. NURSE
923	HEALTH TRAINEES	29	REGISTERED NURSES
924	LAY MIDWIVES	286	PRACTICAL NURSES
925	NURSING AIDES, ORDERLIES, AND ATTENDANTS	287	NURSING AIDES
926	PRACTICAL NURSES	286	PRACTICAL NURSES
931	AIRLINE STEWARDESSES	288	AIRLINE STEWARDESSES
932	ATTENDANTS, RECREATION AND AMUSEMENT	289	ATTENDANTS&USHERS,R.&A.
933	ATTENDANTS, PERSONAL SERVICE, N.E.C.	290	ATTENDANTS,PERSONAL
934	BAGGAGE PORTERS AND BELLHOPS	290	ATTENDANTS,PERSONAL
935	BARBERS	291	BARBERS
940	BOARDING AND LODGINGHOUSE KEEPERS	292	HOUSEKEEPERS
941	BOOTBLACKS	290	ATTENDANTS,PERSONAL
942	CHILD CARE WORKERS, EXC. PRIVATE HOUSEHOLD	293	CHILD CARE,EXC. P.H.
943	ELEVATOR OPERATORS	294	ELEVATOR OPER'S
944	HAIRDRESSERS AND COSMETOLOGISTS	295	HAIRDRESSERS
945	PERSONAL SERVICE APPRENTICES	290	ATTENDANTS,PERSONAL
950	HOUSEKEEPERS, EXC. PRIVATE HOUSEHOLD	292	HOUSEKEEPERS
952	SCHOOL MONITORS	290	ATTENDANTS,PERSONAL
953	USHERS, RECREATION AND AMUSEMENT	289	ATTENDANTS&USHERS,R.&A.
954	WELFARE SERVICE AIDES	39	SOCIAL WK'S
960	CROSSING GUARDS AND BRIDGE TENDERS	296	CROSSING GUARDS
961	FIREMEN, FIRE PROTECTION	297	FIREMEN
962	GUARDS AND WATCHMEN	298	GUARDS&WATCHMEN
963	MARSHALS AND CONSTABLES	299	SHERIFFS,BAILIFFS,ETC.
964	POLICEMEN AND DETECTIVES	300	POLICEMEN&DETECTIVES
965	SHERIFFS AND BAILIFFS	299	SHERIFFS,BAILIFFS,ETC.
976	SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD--ALLOCATED		CODE EXCLUDED
980	CHILD CARE WORKERS, PRIVATE HOUSEHOLD	301	CHILD CARE WK'S,P.H.
981	COOKS, PRIVATE HOUSEHOLD	302	COOKS,P.H.
982	HOUSEKEEPERS, PRIVATE HOUSEHOLD	303	HOUSEKEEPERS,P.H.
983	LAUNDRESSES, PRIVATE HOUSEHOLD	304	MAIDS&SERVANTS,P.H.
984	MAIDS AND SERVANTS, PRIVATE HOUSEHOLD	304	MAIDS&SERVANTS,P.H.
986	PRIVATE HOUSEHOLD WORKERS--ALLOCATED		CODE EXCLUDED

APPENDIX B

RATES OF MOVEMENT

1 ****************** ACCOUNTANTS ******************

RR=.7572 RR*=.6805 EXR=.1012

ENRT=.4049 ENR1=.0177 ENR2=.1112 ENR3=.1112 ENR4=.1648

2 ****************** ARCHITECTS ******************

RR=.8472 RR*=.7837 EXR=.0749

ENRT=.2818 ENR1=.0 ENR2=.0276 ENR3=.0331 ENR4=.2210

3 ****************** COMPUTER PROGRAMMERS ******************

RR=.6058 RR*=.5672 EXR=.0638

ENRT=.4608 ENR1=.0099 ENR2=.0812 ENR3=.1407 ENR4=.2290

4 ****************** COMPUTER SPECIALISTS ******************

RR=.6736 RR*=.6367 EXR=.0547

ENRT=.2879 ENR1=.0078 ENR2=.0532 ENR3=.0516 ENR4=.1753

5 ****************** AERONAUTICAL ENGINEERS ******************

RR=.7114 RR*=.6590 EXR=.0737

ENRT=.3035 ENR1=.0050 ENR2=.0149 ENR3=.0348 ENR4=.2438

6 ****************** CHEMICAL ENGINEERS ******************

RR=.8000 RR*=.7732 EXR=.0335

ENRT=.3909 ENR1=.0 ENR2=.0091 ENR3=.0182 ENR4=.3636

7 ****************** CIVIL ENGINEERS ******************

RR=.7951 RR*=.7258 EXR=.0872

ENRT=.2661 ENR1=.0142 ENR2=.0362 ENR3=.0331 ENR4=.1827

8 ****************** ELECTRICAL ENGINEERS ******************

RR=.7745 RR*=.7300 EXR=.0575

ENRT=.3149 ENR1=.0109 ENR2=.0336 ENR3=.0490 ENR4=.2214

```
9 ******************   INDUSTRIAL ENGINEERS   ******************

                    RR=.7141    RR*=.6690    EXR=.0631

   ENRT=.2068  ENR1=.0044  ENR2=.0264  ENR3=.0341  ENR4=.1419

10 ******************  MECHANICAL ENGINEERS   ******************

                    RR=.7920    RR*=.7345    EXR=.0725

   ENRT=.2638  ENR1=.0057  ENR2=.0213  ENR3=.0156  ENR4=.2213

11 ******************     ENGINEERS,M.S.      ******************

                    RR=.6695    RR*=.6324    EXR=.0553

   ENRT=.3071  ENR1=.0079  ENR2=.0315  ENR3=.0079  ENR4=.2598

12 ******************    SALES ENGINEERS      ******************

                    RR=.7014    RR*=.6769    EXR=.0349

   ENRT=.1343  ENR1=.0035  ENR2=.0035  ENR3=.0106  ENR4=.1166

13 ******************    ENGINEERS,N.E.C.     ******************

                    RR=.5895    RR*=.5459    EXR=.0739

   ENRT=.2172  ENR1=.0055  ENR2=.0197  ENR3=.0568  ENR4=.1354

14 ******************       FORESTERS         ******************

                    RR=.6647    RR*=.5608    EXR=.1563

   ENRT=.4335  ENR1=.1503  ENR2=.0578  ENR3=.0578  ENR4=.1676

15 ******************     LAWYERS&JUDGES      ******************

                    RR=.9384    RR*=.8933    EXR=.0481

   ENRT=.4430  ENR1=.0014  ENR2=.0141  ENR3=.0141  ENR4=.4135

16 ******************       LIBRARIANS        ******************

                    RR=.8044    RR*=.6615    EXR=.1777

   ENRT=.5973  ENR1=.0384  ENR2=.1260  ENR3=.1658  ENR4=.2671
```

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17 ******************     MATH SPECIALISTS     ******************

                  RR=.6835   RR*=.5956   EXR=.1287

   ENRT=.4545  ENR1=.0227  ENR2=.0455  ENR3=.0795  ENR4=.3068

18 ******************   BIOLOGICAL SCIENT'S   ******************

                  RR=.7738   RR*=.6989   EXR=.0968

   ENRT=.4658  ENR1=.0068  ENR2=.0342  ENR3=.0616  ENR4=.3630

19 ******************        CHEMISTS        ******************

                  RR=.7761   RR*=.7092   EXR=.0862

   ENRT=.4430  ENR1=.0076  ENR2=.0304  ENR3=.0709  ENR4=.3342

20 ****************** PHYSICISTS&ASTRONOMERS ******************

                  RR=.8043   RR*=.7817   EXR=.0282

   ENRT=.4615  ENR1=.0     ENR2=.0220  ENR3=.0110  ENR4=.4286

21 ****************** LIFE&PHYSICAL SCIENT'S ******************

                  RR=.7959   RR*=.7459   EXR=.0628

   ENRT=.3750  ENR1=.0197  ENR2=.0526  ENR3=.0592  ENR4=.2434

22 ****************** OPERATIONS RESEARCHERS ******************

                  RR=.6705   RR*=.6295   EXR=.0612

   ENRT=.2183  ENR1=.0044  ENR2=.0371  ENR3=.0611  ENR4=.1157

23 ****************** PERSONNEL&LAB.REL.WK'S ******************

                  RR=.7720   RR*=.6811   EXR=.1178

   ENRT=.2245  ENR1=.0121  ENR2=.0723  ENR3=.0482  ENR4=.0918

24 ******************        DENTISTS        ******************

                  RR=.9654   RR*=.8955   EXR=.0724

   ENRT=.5988  ENR1=.0060  ENR2=.0240  ENR3=.0180  ENR4=.5509
```

25 ****************** PHARMACISTS ******************

RR=.8907 RR*=.8075 EXR=.0935

ENRT=.5585 ENR1=.0189 ENR2=.0377 ENR3=.0906 ENR4=.4113

26 ****************** PHYSICIANS ******************

RR=.9536 RR*=.9052 EXR=.0507

ENRT=.6163 ENR1=.0038 ENR2=.0208 ENR3=.0208 ENR4=.5709

27 ****************** HEALTH PRACT.,N.E.C. ******************

RR=.8973 RR*=.8470 EXR=.0560

ENRT=.4634 ENR1=.0 ENR2=.0163 ENR3=.0244 ENR4=.4228

28 ****************** DIETITIANS ******************

RR=.7932 RR*=.6433 EXR=.1890

ENRT=.6085 ENR1=.2364 ENR2=.1473 ENR3=.0465 ENR4=.1783

29 ****************** REGISTERED NURSES ******************

RR=.8524 RR*=.6417 EXR=.2472

ENRT=.7325 ENR1=.0649 ENR2=.2507 ENR3=.3004 ENR4=.1166

30 ****************** THERAPISTS ******************

RR=.8090 RR*=.6288 EXR=.2227

ENRT=.5929 ENR1=.0310 ENR2=.1416 ENR3=.1150 ENR4=.3053

31 ****************** CLINICAL LAB. TECH'S ******************

RR=.7621 RR*=.5909 EXR=.2247

ENRT=.6595 ENR1=.0263 ENR2=.1990 ENR3=.2368 ENR4=.1974

32 ****************** RADIOLOGIC TECH'S ******************

RR=.8649 RR*=.6647 EXR=.2315

ENRT=.7626 ENR1=.0396 ENR2=.4460 ENR3=.2554 ENR4=.0216

33 ****************** HEALTH TECH'S,N.E.C. ******************

RR=.6844 RR*=.5588 EXR=.1836

ENRT=.5701 ENR1=.0542 ENR2=.1495 ENR3=.2542 ENR4=.1121

34 ****************** CLERGYMEN ******************

RR=.8524 RR*=.7827 EXR=.0818

ENRT=.3924 ENR1=.0206 ENR2=.0380 ENR3=.0554 ENR4=.2785

35 ****************** RELIGIOUS WK'S ******************

RR=.5367 RR*=.4528 EXR=.1564

ENRT=.4667 ENR1=.0564 ENR2=.1282 ENR3=.1538 ENR4=.1282

36 ****************** ECONOMISTS ******************

RR=.6230 RR*=.5640 EXR=.0948

ENRT=.2537 ENR1=.0 ENR2=.0358 ENR3=.0478 ENR4=.1701

37 ****************** PSYCHOLOGISTS ******************

RR=.8143 RR*=.7755 EXR=.0476

ENRT=.4305 ENR1=.0066 ENR2=.0331 ENR3=.0331 ENR4=.3576

38 ****************** SOCIAL SCIENT'S,N.E.C. ******************

RR=.7294 RR*=.6813 EXR=.0659

ENRT=.3696 ENR1=.0 ENR2=.0217 ENR3=.0543 ENR4=.2935

39 ****************** SOCIAL WK'S ******************

RR=.7374 RR*=.6134 EXR=.1682

ENRT=.5551 ENR1=.0529 ENR2=.0687 ENR3=.0695 ENR4=.3640

40 ****************** RECREATION WK'S ******************

RR=.5139 RR*=.3957 EXR=.2301

ENRT=.6493 ENR1=.1188 ENR2=.1478 ENR3=.2638 ENR4=.1188

41 ********************TEACHERS, COLLEGE&UNIV. *******************

RR=.8004 RR*=.7269 EXR=.0919

ENRT=.5048 ENR1=.0088 ENR2=.0204 ENR3=.0849 ENR4=.3907

42 ******************** ADULT ED. TEACHERS *******************

RR=.6264 RR*=.5278 EXR=.1574

ENRT=.4046 ENR1=.0549 ENR2=.0809 ENR3=.0780 ENR4=.1908

43 ********************ELEMENTARY SCH.TEACHERS *******************

RR=.6750 RR*=.5358 EXR=.2063

ENRT=.7392 ENR1=.0142 ENR2=.0391 ENR3=.0808 ENR4=.6051

44 ******************** KINDERGARTEN TEACHERS *******************

RR=.7824 RR*=.6157 EXR=.2131

ENRT=.6036 ENR1=.0649 ENR2=.1200 ENR3=.1600 ENR4=.2638

45 ********************SECONDARY SCH. TEACHERS *******************

RR=.7701 RR*=.6592 EXR=.1440

ENRT=.4913 ENR1=.0054 ENR2=.0153 ENR3=.0258 ENR4=.4448

46 ******************** TEACHERS,N.E.C. *******************

RR=.7209 RR*=.5996 EXR=.1681

ENRT=.5908 ENR1=.1014 ENR2=.1262 ENR3=.1887 ENR4=.1745

47 ******************** AG.&BIO. TECH'S *******************

RR=.5917 RR*=.5119 EXR=.1349

ENRT=.5176 ENR1=.0765 ENR2=.1765 ENR3=.1706 ENR4=.0941

48 ******************** CHEMICAL TECH'S *******************

RR=.6427 RR*=.5929 EXR=.0774

ENRT=.4785 ENR1=.0561 ENR2=.1353 ENR3=.1881 ENR4=.0990

```
49 ******************         DRAFTSMEN          ******************
                 RR=.7114   RR*=.6545   EXP=.0801
   ENRT=.5215  ENR1=.0329  ENR2=.2138  ENR3=.2404  ENR4=.0345

50 ****************** ELECTRICAL ENG. TECH'S ******************
                 RR=.6331   RR*=.5960   EXP=.0585
   ENRT=.4011  ENR1=.0361  ENR2=.1885  ENR3=.1524  ENR4=.0241

51 ****************** IND.&MECH. ENG. TECH'S ******************
                 RR=.6058   RR*=.5637   EXP=.0695
   ENRT=.2611  ENR1=.0222  ENR2=.1167  ENR3=.1000  ENR4=.0222

52 ******************         SURVEYORS          ******************
                 RR=.5789   RR*=.5326   EXP=.0801
   ENRT=.4491  ENR1=.0737  ENR2=.2035  ENR3=.1333  ENR4=.0386

53 ******************ENG.&SCI. TECH'S,N.E.C. ******************
                 RR=.5827   RR*=.5270   EXP=.0956
   ENRT=.4401  ENR1=.0249  ENR2=.1467  ENR3=.1975  ENR4=.0709

54 ******************PILOTS&FLIGHT ENGINEERS ******************
                 RR=.8625   RR*=.7984   EXP=.0743
   ENRT=.3811  ENR1=.0082  ENR2=.0656  ENR3=.1025  ENR4=.2049

55 ******************AIR TRAFFIC CONTROLLERS ******************
                 RR=.8516   RR*=.8115   EXP=.0471
   ENRT=.3077  ENR1=.0256  ENR2=.1410  ENR3=.0897  ENR4=.0513

56 ******************      RADIO OPERATORS      ******************
                 RR=.5938   RR*=.5220   EXP=.1209
   ENRT=.3742  ENR1=.0452  ENR2=.2129  ENR3=.1161  ENR4=.0
```

57 ****************** TECHNICIANS,N.E.C. ******************

RR=.5110 RR*=.4780 EXR=.0645

ENRT=.3224 ENR1=.0187 ENR2=.1262 ENR3=.1262 ENR4=.0514

58 ****************** VOC.&ED. COUNSELORS ******************

RR=.7357 RR*=.6640 EXR=.0974

ENRT=.3464 ENR1=.0091 ENR2=.0212 ENR3=.1331 ENR4=.1831

59 ****************** ATHLETES&KINDRED WK'S ******************

RR=.5431 RR*=.4533 EXR=.1653

ENRT=.6282 ENR1=.1314 ENR2=.1635 ENR3=.2468 ENR4=.0865

60 ****************** AUTHORS ******************

RR=.6842 RR*=.5792 EXR=.1535

ENRT=.3065 ENR1=.0242 ENR2=.0323 ENR3=.0726 ENR4=.1774

61 ****************** DESIGNERS ******************

RR=.7088 RR*=.6327 EXR=.1075

ENRT=.3140 ENR1=.0320 ENR2=.0700 ENR3=.0920 ENR4=.1200

62 ****************** EDITORS&REPORTERS ******************

RR=.7228 RR*=.6106 EXR=.1552

ENRT=.4760 ENR1=.0277 ENR2=.0844 ENR3=.1557 ENR4=.2082

63 ****************** MUSICIANS&COMPOSERS ******************

RR=.6900 RR*=.5580 EXR=.1913

ENRT=.6841 ENR1=.1715 ENR2=.1653 ENR3=.2636 ENR4=.0837

64 ****************** PAINTERS&SCULPTORS ******************

RR=.8101 RR*=.7018 EXR=.1337

ENRT=.5279 ENR1=.0395 ENR2=.1488 ENR3=.2070 ENR4=.1326

65 ****************** PHOTOGRAPHERS ******************

RR=.7745 RR*=.6978 EXR=.0989

ENRT=.4253 ENR1=.0690 ENR2=.1379 ENR3=.1418 ENR4=.0766

66 ****************** PUBLIC RELATIONS MEN ******************

RR=.6253 RR*=.5424 EXR=.1325

ENRT=.2814 ENR1=.0151 ENR2=.0477 ENR3=.1005 ENR4=.1181

67 ****************** RADIO&T.V. ANNOUNCERS ******************

RR=.5879 RR*=.5511 EXR=.0625

ENRT=.6195 ENR1=.1593 ENR2=.1681 ENR3=.2389 ENR4=.0531

68 ******************WRITERS&ENTERT'S,N.E.C. ******************

RR=.5397 RR*=.4031 EXR=.2531

ENRT=.4582 ENR1=.0883 ENR2=.1289 ENR3=.1289 ENR4=.1122

69 ****************** RESEARCH WK'S,N.E.C. ******************

RR=.4620 RR*=.4054 EXR=.1226

ENRT=.5575 ENR1=.0174 ENR2=.0455 ENR3=.1203 ENR4=.3743

70 ******************ASSESSORS,ETC.,LOC.PUB. ******************

RR=.7461 RR*=.6025 EXR=.1925

ENRT=.2847 ENR1=.0365 ENR2=.1460 ENR3=.0438 ENR4=.0584

71 ******************BANK OFFICERS&FIN.MGRS. ******************

RR=.7191 RR*=.6534 EXR=.0913

ENRT=.2667 ENR1=.0112 ENR2=.0908 ENR3=.0763 ENR4=.0884

72 ******************BUYERS,WHOLESALE&RETAIL ******************

RR=.6817 RR*=.5871 EXR=.1388

ENRT=.2054 ENR1=.0250 ENR2=.0663 ENR3=.0696 ENR4=.0446

73 ****************** CREDIT MEN ******************

RR=.5714 RR*=.5009 EXR=.1234

ENRT=.2361 ENR1=.0208 ENR2=.1042 ENR3=.0799 ENR4=.0313

74 ****************** FUNERAL DIR.&EMBALMERS ******************

RR=.7899 RR*=.7290 EXR=.0771

ENRT=.3364 ENR1=.0654 ENR2=.0467 ENR3=.1402 ENR4=.0841

75 ****************** HEALTH ADMINISTRATORS ******************

RR=.7286 RR*=.6374 EXR=.1252

ENRT=.2319 ENR1=.0242 ENR2=.0870 ENR3=.0362 ENR4=.0845

76 ****************** INSPECTORS, PUB.ADMIN. ******************

RR=.8011 RR*=.7024 EXR=.1232

ENRT=.1841 ENR1=.0364 ENR2=.0750 ENR3=.0386 ENR4=.0341

77 ****************** MGRS.&SUPT'S,BUILDING ******************

RR=.7421 RR*=.5633 EXR=.2410

ENRT=.3283 ENR1=.1130 ENR2=.0978 ENR3=.0717 ENR4=.0457

78 ****************** OFFICE MGRS.,N.E.C. ******************

RR=.6079 RR*=.5268 EXR=.1333

ENRT=.1785 ENR1=.0140 ENR2=.0789 ENR3=.0526 ENR4=.0329

79 ****************** OFFICERS,ETC.;SHIP ******************

RR=.7306 RR*=.5618 EXR=.2311

ENRT=.2317 ENR1=.0976 ENR2=.0732 ENR3=.0488 ENR4=.0122

80 ****************** OFFICIALS;PUB.ADMIN. ******************

RR=.7266 RR*=.6281 EXR=.1356

ENRT=.1904 ENR1=.0218 ENR2=.0562 ENR3=.0471 ENR4=.0653

81 ******************OFFICIALS; LODGES, ETC. ******************

RR=.7896 RR*=.7008 EXR=.1125

ENRT=.1951 ENR1=.0488 ENR2=.0488 ENR3=.0439 ENR4=.0537

82 ****************** POSTMASTER&MAIL SUPT'S ******************

RR=.8544 RR*=.7170 EXR=.1608

ENRT=.1034 ENR1=.0276 ENR2=.0690 ENR3=.0069 ENR4=.0

83 ****************** PURCHASING AGENTS ******************

RR=.7433 RR*=.6653 EXR=.1049

ENRT=.1966 ENR1=.0246 ENR2=.0676 ENR3=.0467 ENR4=.0577

84 ****************** RAILROAD CONDUCTORS ******************

RR=.8879 RR*=.7181 EXR=.1912

ENRT=.1359 ENR1=.0291 ENR2=.0971 ENR3=.0097 ENR4=.0

85 ****************** RESTAURANT,ETC. MGRS. ******************

RR=.6097 RR*=.4949 EXR=.1883

ENRT=.2891 ENR1=.0949 ENR2=.1145 ENR3=.0626 ENR4=.0171

86 ****************** SALES MGRS.,RETAIL ******************

RR=.5778 RR*=.5178 EXR=.1039

ENRT=.2435 ENR1=.0433 ENR2=.1095 ENR3=.0630 ENR4=.0276

87 ****************** SALES MGRS.,EXC.RETAIL ******************

RR=.6974 RR*=.6504 EXR=.0673

ENRT=.0862 ENR1=.0085 ENR2=.0192 ENR3=.0262 ENR4=.0323

88 ****************** SCH. ADMIN.,COLLEGE ******************

RR=.5556 RR*=.4845 EXR=.1279

ENRT=.1741 ENR1=.0 ENR2=.0223 ENR3=.0179 ENR4=.1339

89 ****************** SCH. ADMIN.,ELEM.&SEC. ******************

RR=.8053 RR*=.7202 EXR=.1057

ENRT=.1233 ENR1=.0171 ENR2=.0281 ENR3=.0183 ENR4=.0598

90 ****************** MGRS.&ADMIN.,SAL. ******************

RR=.6029 RR*=.5456 EXR=.0951

ENRT=.1824 ENR1=.0317 ENR2=.0637 ENR3=.0457 ENR4=.0413

91 ****************** MGRS.&ADMIN.,S.E. ******************

RR=.7061 RR*=.6746 EXR=.0446

ENRT=.0882 ENR1=.0273 ENR2=.0310 ENR3=.0173 ENR4=.0126

92 ****************** ADVERTISING AGENTS ******************

RR=.5514 RR*=.5009 EXR=.0916

ENRT=.2973 ENR1=.0240 ENR2=.0931 ENR3=.1051 ENR4=.0751

93 ****************** DEMONSTRATORS ******************

RR=.6139 RR*=.4181 EXR=.3190

ENRT=.6345 ENR1=.1552 ENR2=.3517 ENR3=.0759 ENR4=.0517

94 ****************** HUCKSTERS&PEDDLERS ******************

RR=.5525 RR*=.4092 EXR=.2594

ENRT=.6968 ENR1=.2279 ENR2=.3435 ENR3=.0981 ENR4=.0273

95 ****************** INSURANCE AGENTS ******************

RR=.6683 RR*=.6153 EXR=.0792

ENRT=.2937 ENR1=.0270 ENR2=.1204 ENR3=.0801 ENR4=.0663

96 ****************** NEWSBOYS ******************

RR=.4795 RR*=.3947 EXR=.1767

ENRT=.8561 ENR1=.7288 ENR2=.0886 ENR3=.0332 ENR4=.0055

97 ****************** REAL ESTATE AGENTS ******************

RR=.7504 RR*=.6264 EXR=.1652

ENRT=.3147 ENR1=.0371 ENR2=.1397 ENR3=.0888 ENR4=.0491

98 ****************** STOCK&BOND SALESMEN ******************

RR=.7748 RR*=.6985 EXR=.0985

ENRT=.2633 ENR1=.0122 ENR2=.0347 ENR3=.0490 ENR4=.1673

99 ****************** SALES REP'S,MFG. ******************

RR=.6182 RR*=.5692 EXR=.0793

ENRT=.2342 ENR1=.0426 ENR2=.0660 ENR3=.0607 ENR4=.0649

100 ****************** SALES REP'S,WHOLESALE ******************

RR=.6989 RR*=.6459 EXR=.0758

ENRT=.2489 ENR1=.0444 ENR2=.0823 ENR3=.0758 ENR4=.0465

101 ****************** SALES CLERKS, RETAIL ******************

RR=.6017 RR*=.4556 EXR=.2428

ENRT=.6878 ENR1=.2801 ENR2=.2743 ENR3=.1151 ENR4=.0182

102 ****************** SALESMEN, RETAIL ******************

RR=.6304 RR*=.5636 EXR=.1060

ENRT=.3286 ENR1=.0958 ENR2=.1439 ENR3=.0724 ENR4=.0165

103 ****************** SALESMEN,SERV.&CONST. ******************

RR=.5453 RR*=.4625 EXR=.1520

ENRT=.3878 ENR1=.1403 ENR2=.1192 ENR3=.0940 ENR4=.0344

104 ****************** BANK TELLERS ******************

RR=.5952 RR*=.4483 EXR=.2468

ENRT=.6421 ENR1=.0451 ENR2=.4102 ENR3=.1643 ENR4=.0225

105 ****************** BILLING CLERKS ******************

RR=.5543 RR*=.4167 EXR=.2483

ENRT=.5142 ENR1=.0771 ENR2=.3302 ENR3=.0947 ENR4=.0122

106 ****************** BOOKKEEPERS ******************

RR=.7439 RR*=.5697 EXR=.2342

ENRT=.4934 ENR1=.0605 ENR2=.3045 ENR3=.1086 ENR4=.0199

107 ****************** CASHIERS ******************

RR=.5690 RR*=.4009 EXR=.2955

ENRT=.7464 ENR1=.3274 ENR2=.2987 ENR3=.1108 ENR4=.0096

108 ****************** CLERICAL SUPERVISORS ******************

RR=.7200 RR*=.6279 EXR=.1279

ENRT=.1626 ENR1=.0113 ENR2=.0934 ENR3=.0403 ENR4=.0177

109 ****************** COLLECTORS, BILL&ACCT. ******************

RR=.4475 RR*=.3746 EXR=.1629

ENRT=.4016 ENR1=.0628 ENR2=.1940 ENR3=.1175 ENR4=.0273

110 ******************COUNTER CLERKS,EXC.FOOD ******************

RR=.5248 RR*=.3958 EXR=.2459

ENRT=.6103 ENR1=.2168 ENR2=.2607 ENR3=.1209 ENR4=.0119

111 ****************** DISPATCHERS,VEHICLE ******************

RR=.6569 RR*=.5853 EXR=.1090

ENRT=.3176 ENR1=.0912 ENR2=.1384 ENR3=.0660 ENR4=.0220

112 ****************** ENUMERAT'S&INTERVIEW'S ******************

RR=.3953 RR*=.2772 EXR=.2989

ENRT=.6595 ENR1=.0959 ENR2=.3223 ENR3=.1702 ENR4=.0711

113 ****************** ESTIMAT'S&INVESTIGAT'S ******************

RR=.6458 RR*=.5485 EXR=.1506

ENRT=.3681 ENR1=.0301 ENR2=.1794 ENR3=.0990 ENR4=.0596

114 ****************** EXPEND.&PROD.CONTROL'S ******************

RR=.6286 RR*=.5556 EXR=.1160

ENRT=.2866 ENR1=.0323 ENR2=.1465 ENR3=.0755 ENR4=.0323

115 ****************** FILE CLERKS ******************

RR=.5497 RR*=.3800 EXR=.3087

ENRT=.6607 ENR1=.1638 ENR2=.3661 ENR3=.1153 ENR4=.0155

116 ******************INSURANCE ADJUST'S,ETC. ******************

RR=.6637 RR*=.5981 EXR=.0988

ENRT=.3957 ENR1=.0065 ENR2=.1478 ENR3=.0848 ENR4=.1565

117 ****************** LIBRARY ATTENDANTS ******************

RR=.5306 RR*=.4247 EXR=.1996

ENRT=.7779 ENR1=.1543 ENR2=.2158 ENR3=.3160 ENR4=.0918

118 ****************** MAIL CARRIERS, P.O. ******************

RR=.8028 RR*=.7428 EXR=.0748

ENRT=.3631 ENR1=.0614 ENR2=.1972 ENR3=.0916 ENR4=.0129

119 ****************** MAIL HANDLERS,EXC.P.O. ******************

RR=.4838 RR*=.3817 EXR=.2110

ENRT=.6287 ENR1=.1829 ENR2=.2859 ENR3=.1446 ENR4=.0153

120 ****************** MESSENGERS&OFFICE BOYS ******************

RR=.4706 RR*=.3599 EXR=.2353

ENRT=.6558 ENR1=.2814 ENR2=.2163 ENR3=.1442 ENR4=.0140

121 ****************** METER READERS ******************

RR=.6056 RR*=.5560 EXR=.0819

ENRT=.3316 ENR1=.0474 ENR2=.2211 ENR3=.0632 ENR4=.0

122 ****************** OFFICE MACHINE;BILLING ******************

RR=.4757 RR*=.3189 EXR=.3297

ENRT=.5553 ENR1=.0765 ENR2=.3702 ENR3=.1006 ENR4=.0080

123 ****************** OFFICE MACHINE;CALC. ******************

RR=.5437 RR*=.4017 EXR=.2612

ENRT=.4913 ENR1=.0588 ENR2=.3287 ENR3=.1003 ENR4=.0035

124 ****************** COMPUTER OPERATORS ******************

RR=.5461 RR*=.4950 EXR=.0936

ENRT=.5192 ENR1=.0346 ENR2=.2818 ENR3=.1693 ENR4=.0334

125 ****************** KEY PUNCH OPERATORS ******************

RR=.6952 RR*=.5075 EXR=.2701

ENRT=.6782 ENR1=.0709 ENR2=.5173 ENR3=.0825 ENR4=.0075

126 ****************** OFFICE MACHINE,N.E.C. ******************

RR=.5947 RR*=.4397 EXR=.2606

ENRT=.5954 ENR1=.1241 ENR2=.3057 ENR3=.1471 ENR4=.0184

127 ****************** PAYROLL CLERKS ******************

RR=.6374 RR*=.5076 EXR=.2036

ENRT=.3851 ENR1=.0416 ENR2=.2440 ENR3=.0897 ENR4=.0098

128 ****************** POSTAL CLERKS ******************

RR=.7464 RR*=.6535 EXR=.1245

ENRT=.4355 ENR1=.0875 ENR2=.2359 ENR3=.1016 ENR4=.0104

129 ****************** PROOFREADERS ******************

RR=.6797 RR*=.5123 EXR=.2463

ENRT=.5621 ENR1=.0710 ENR2=.2781 ENR3=.1183 ENR4=.0947

130 ****************** RECEPTIONISTS ******************

RR=.5531 RR*=.3753 EXR=.3214

ENRT=.6542 ENR1=.1143 ENR2=.3432 ENR3=.1716 ENR4=.0251

131 ****************** SECRETARIES ******************

RR=.8137 RR*=.5853 EXR=.2806

ENRT=.6805 ENR1=.0516 ENR2=.4027 ENR3=.1978 ENR4=.0284

132 ****************** SHIPPING CLERKS ******************

RR=.5884 RR*=.5268 EXR=.1047

ENRT=.4015 ENR1=.1319 ENR2=.1983 ENR3=.0619 ENR4=.0094

133 ****************** STATISTICAL CLERKS ******************

RR=.6120 RR*=.4918 EXR=.1963

ENRT=.4105 ENR1=.0564 ENR2=.2263 ENR3=.1025 ENR4=.0253

134 ****************** STENOGRAPHERS ******************

RR=.5844 RR*=.4247 EXR=.2733

ENRT=.5983 ENR1=.0399 ENR2=.3975 ENR3=.1527 ENR4=.0083

135 ****************** STOCK CLERKS ******************

RR=.5554 RR*=.4759 EXR=.1432

ENRT=.4874 ENR1=.1750 ENR2=.2106 ENR3=.0934 ENR4=.0084

136 ****************** TEACHER AIDES ******************

RR=.6052 RR*=.4620 EXR=.2366

ENRT=.7804 ENR1=.1411 ENR2=.3955 ENR3=.2071 ENR4=.0366

137 ****************** TELEPHONE OPERATORS ******************

RR=.6783 RR*=.4821 EXR=.2893

ENRT=.7353 ENR1=.1425 ENR2=.4666 ENR3=.1222 ENR4=.0040

138 ****************** TICKET&EXPRESS AGENTS ******************

RR=.6569 RR*=.5505 EXR=.1619

ENRT=.3912 ENR1=.0240 ENR2=.2076 ENR3=.1178 ENR4=.0419

139 ****************** TYPISTS ******************

RR=.6031 RR*=.4139 EXR=.3137

ENRT=.6614 ENR1=.0905 ENR2=.4231 ENR3=.1339 ENR4=.0139

140 ****************** WEIGHERS ******************

RR=.6718 RR*=.5282 EXR=.2137

ENRT=.3583 ENR1=.1375 ENR2=.1667 ENR3=.0458 ENR4=.0083

141 ****************** CLERICAL WK'S,M.S. ******************

RR=.5262 RR*=.4162 EXR=.2092

ENRT=.4844 ENR1=.0853 ENR2=.2541 ENR3=.1106 ENR4=.0345

142 ****************** CLERICAL WK'S,N.S. ******************

RR=.3004 RR*=.2273 EXR=.2432

ENRT=.5913 ENR1=.1230 ENR2=.3213 ENR3=.1291 ENR4=.0179

143 ****************** BAKERS ******************

RR=.7036 RR*=.5871 EXR=.1655

ENRT=.4572 ENR1=.2714 ENR2=.1443 ENR3=.0391 ENR4=.0024

144 ****************** METAL CRAFTSMEN,M.S. ******************

RR=.6870 RR*=.5898 EXR=.1415

ENRT=.2725 ENR1=.1341 ENR2=.1187 ENR3=.0198 ENR4=.0

145 ****************** BOILERMAKERS ******************

RR=.7500 RR*=.6517 EXR=.1311

ENRT=.2044 ENR1=.0511 ENR2=.1241 ENR3=.0292 ENR4=.0

146 ****************** BOOKBINDERS ******************

RR=.6955 RR*=.5222 EXR=.2491

ENRT=.4532 ENR1=.1583 ENR2=.2158 ENR3=.0647 ENR4=.0144

147 ****************** BRICKMASONS ******************

RR=.7410 RR*=.6148 EXR=.1703

ENRT=.3962 ENR1=.2034 ENR2=.1551 ENR3=.0314 ENR4=.0063

148 ****************** BULLDOZER OPERATORS ******************

RR=.6451 RR*=.5300 EXR=.1785

ENRT=.2179 ENR1=.1068 ENR2=.0915 ENR3=.0196 ENR4=.0

149 ****************** CABINETMAKERS ******************

RR=.6419 RR*=.5683 EXR=.1147

ENRT=.2872 ENR1=.1318 ENR2=.1351 ENR3=.0203 ENR4=.0

150 ******************CARPENTERS&FLOOR LAYERS ******************

RR=.7662 RR*=.6240 EXR=.1855

ENRT=.3231 ENR1=.1306 ENR2=.1394 ENR3=.0450 ENR4=.0081

151 ****************** CARPET INSTALLERS ******************

RR=.7778 RR*=.7089 EXR=.0886

ENRT=.4194 ENR1=.2120 ENR2=.1843 ENR3=.0230 ENR4=.0

152 ****************** CEMENT&PLASTER WK'S ******************

RR=.7591 RR*=.5984 EXR=.2117

ENRT=.2040 ENR1=.1008 ENR2=.0756 ENR3=.0277 ENR4=.0

153 ******************COMPOSITORS&TYPESETTERS ******************

RR=.6650 RR*=.6047 EXR=.0906

ENRT=.4493 ENR1=.1258 ENR2=.2467 ENR3=.0735 ENR4=.0033

154 ****************** CRANEMEN&DERRICKMEN ******************

RR=.7700 RR*=.6598 EXR=.1432

ENRT=.1939 ENR1=.0944 ENR2=.0809 ENR3=.0169 ENR4=.0017

155 ******************DECOR'S&WINDOW DRESSERS ******************

RR=.7188 RR*=.5712 EXR=.2054

ENRT=.6139 ENR1=.1389 ENR2=.2583 ENR3=.1667 ENR4=.0500

156 ****************** DENTAL LAB. TECH'S ******************

RR=.8535 RR*=.7972 EXR=.0660

ENRT=.5053 ENR1=.0737 ENR2=.2316 ENR3=.1684 ENR4=.0316

157 ****************** ELECTRICIANS ******************

RR=.8171 RR*=.7376 EXR=.0973

ENRT=.3266 ENR1=.0619 ENR2=.1930 ENR3=.0674 ENR4=.0043

158 ****************** ELECTRIC POWER LINEMEN ******************

RR=.7490 RR*=.6978 EXR=.0685

ENRT=.3247 ENR1=.0753 ENR2=.1974 ENR3=.0468 ENR4=.0052

159 ******************PRINTING CRAFTSMEN,M.S. ******************

RR=.7193 RR*=.6316 EXR=.1220

ENRT=.3805 ENR1=.1062 ENR2=.2035 ENR3=.0619 ENR4=.0088

160 ******************EXCAVATING MACH. OPER'S ******************

RR=.6806 RR*=.5674 EXR=.1664

ENRT=.2252 ENR1=.1071 ENR2=.0931 ENR3=.0210 ENR4=.0040

```
161 ******************      FOREMEN,N.E.C.      ******************

                   RR=.7075   RR*=.6299   EXR=.1097

    ENRT=.1213  ENR1=.0359  ENR2=.0488  ENR3=.0210  ENR4=.0154

162 ******************         GLAZIERS         ******************

                   RR=.7700   RR*=.6968   EXR=.0950

    ENRT=.4286  ENR1=.1143  ENR2=.2000  ENR3=.0857  ENR4=.0286

163 ******************     INSPECTORS,N.E.C.    ******************

                   RR=.7144   RR*=.6200   EXR=.1322

    ENRT=.2657  ENR1=.0711  ENR2=.1371  ENR3=.0321  ENR4=.0254

164 ******************  JEWELERS&WATCHMAKERS    ******************

                   RR=.7994   RR*=.7094   EXR=.1126

    ENRT=.4845  ENR1=.1856  ENR2=.2062  ENR3=.0722  ENR4=.0206

165 ****************** JOB&DIE SETTERS,METAL    ******************

                   RR=.7270   RR*=.6607   EXR=.0912

    ENRT=.1518  ENR1=.0651  ENR2=.0771  ENR3=.0096  ENR4=.0

166 ******************  LOCOMOTIVE ENGINEERS    ******************

                   RR=.9114   RR*=.7667   EXR=.1588

    ENRT=.0538  ENR1=.0323  ENR2=.0108  ENR3=.0108  ENR4=.0

167 ****************** BRAKEMEN&FIREMEN,R.R.    ******************

                   RR=.7192   RR*=.6691   EXR=.0698

    ENRT=.3547  ENR1=.0769  ENR2=.2009  ENR3=.0684  ENR4=.0085

168 ******************        MACHINISTS        ******************

                   RR=.5978   RR*=.5347   EXR=.1055

    ENRT=.3007  ENR1=.0947  ENR2=.1674  ENR3=.0373  ENR4=.0013
```

169 ****************** MECHANICS;A.C.,ETC. ******************

RR=.7629 RR*=.6952 EXR=.0888

ENRT=.2516 ENR1=.0832 ENR2=.1310 ENR3=.0353 ENR4=.0021

170 ****************** MECHANICS,AIRCRAFT ******************

RR=.7579 RR*=.7097 EXR=.0636

ENRT=.3603 ENR1=.0612 ENR2=.1983 ENR3=.0909 ENR4=.0099

171 ****************** AUTO BODY REPAIRMEN ******************

RR=.7507 RR*=.7060 EXR=.0596

ENRT=.3816 ENR1=.1677 ENR2=.1677 ENR3=.0461 ENR4=.0

172 ****************** AUTOMOBILE MECHANICS ******************

RR=.7244 RR*=.6622 EXR=.0859

ENRT=.3985 ENR1=.1698 ENR2=.1796 ENR3=.0462 ENR4=.0030

173 ****************** COMPUTER REPAIRMEN ******************

RR=.7771 RR*=.7578 EXR=.0248

ENRT=.4186 ENR1=.0349 ENR2=.2035 ENR3=.1570 ENR4=.0233

174 ****************** MECHANICS,FARM IMP. ******************

RR=.5805 RR*=.5352 EXR=.0781

ENRT=.3000 ENR1=.1187 ENR2=.1375 ENR3=.0437 ENR4=.0

175 ****************** MECHANICS,HEAVY EQUIP. ******************

RR=.7679 RR*=.6982 EXR=.0907

ENRT=.2072 ENR1=.0685 ENR2=.1136 ENR3=.0234 ENR4=.0017

176 ******************MECHANICS,H.H.APPLIANCE ******************

RR=.7375 RR*=.6775 EXR=.0814

ENRT=.3071 ENR1=.0960 ENR2=.1536 ENR3=.0499 ENR4=.0077

177 ******************* OFFICE MACH. REPAIRMEN ******************

RR=.7183 RR*=.6711 EXR=.0658

ENRT=.4203 ENR1=.0338 ENR2=.2705 ENR3=.1111 ENR4=.0048

178 ****************** RADIO&T.V. REPAIRMEN *****************

RR=.7358 RR*=.6738 EXR=.0842

ENRT=.4413 ENR1=.1174 ENR2=.2132 ENR3=.1041 ENR4=.0066

179 ******************MECHANICS,R.R.&CAR SHOP ******************

RR=.7812 RR*=.6711 EXR=.1410

ENRT=.1938 ENR1=.0308 ENR2=.1322 ENR3=.0264 ENR4=.0044

180 ******************MECHANICS&REPAIRMEN,M.S ******************

RR=.7183 RR*=.6515 EXR=.0931

ENRT=.3119 ENR1=.1008 ENR2=.1590 ENR3=.0489 ENR4=.0031

181 ******************MECHANICS&REPAIRMEN,N.S ******************

RR=.3459 RR*=.3089 EXR=.1069

ENRT=.2094 ENR1=.0682 ENR2=.1082 ENR3=.0282 ENR4=.0047

182 ****************** MILLWRIGHTS ******************

RR=.7508 RR*=.6671 EXR=.1114

ENRT=.1242 ENR1=.0359 ENR2=.0686 ENR3=.0196 ENR4=.0

183 ****************** OPTICIANS ******************

RR=.8186 RR*=.7489 EXR=.0852

ENRT=.4561 ENR1=.1754 ENR2=.2193 ENR3=.0614 ENR4=.0

184 ****************** PAINTERS,CONST.&MAINT. ******************

RR=.7722 RR*=.6021 EXR=.2203

ENRT=.4030 ENR1=.2065 ENR2=.1426 ENR3=.0468 ENR4=.0070

185 ****************** PATTERN&MODEL MAKERS ******************

RR=.7866 RR*=.7037 EXR=.1054

ENRT=.2213 ENR1=.0492 ENR2=.1066 ENR3=.0574 ENR4=.0082

186 ****************** PLUMBERS&PIPE FITTERS ******************

RR=.8250 RR*=.7286 EXR=.1169

ENRT=.3336 ENR1=.1087 ENR2=.1832 ENR3=.0376 ENR4=.0041

187 ******************PRESSMEN&PLATE PRINTERS ******************

RR=.7871 RR*=.7132 EXR=.0939

ENRT=.3791 ENR1=.1061 ENR2=.2093 ENR3=.0622 ENR4=.0014

188 ****************** ROFFERS&SLATERS ******************

RR=.6659 RR*=.5500 EXR=.1740

ENRT=.3938 ENR1=.2239 ENR2=.1236 ENR3=.0347 ENR4=.0116

189 ****************** SHEETMETAL WK'S ******************

RR=.7290 RR*=.6580 EXR=.0974

ENRT=.3355 ENR1=.1097 ENR2=.1915 ENR3=.0344 ENR4=.0

190 ****************** STATIONARY ENGINEERS ******************

RR=.7327 RR*=.6387 EXR=.1282

ENRT=.1852 ENR1=.0478 ENR2=.0941 ENR3=.0318 ENR4=.0116

191 ****************** STRUCTURAL METAL WK'S ******************

RR=.6731 RR*=.5963 EXR=.1141

ENRT=.2303 ENR1=.0871 ENR2=.1208 ENR3=.0169 ENR4=.0056

192 ****************** TAILORS ******************

RR=.7464 RR*=.6059 EXR=.1882

ENRT=.4170 ENR1=.2556 ENR2=.1390 ENR3=.0224 ENR4=.0

193 ****************** TELEPHONE INSTALLERS ******************

RR=.7658 RR*=.7270 EXR=.0507

ENRT=.4752 ENR1=.0406 ENR2=.3277 ENR3=.1000 ENR4=.0069

194 ****************** TELEPHONE LINEMEN ******************

RR=.5662 RR*=.5332 EXR=.0584

ENRT=.4669 ENR1=.0568 ENR2=.3533 ENR3=.0568 ENR4=.0

195 ****************** TILE SETTERS ******************

RR=.7536 RR*=.6677 EXR=.1139

ENRT=.3721 ENR1=.1860 ENR2=.1628 ENR3=.0233 ENR4=.0

196 ****************** TOOL&DIE MAKERS ******************

RR=.8158 RR*=.7300 EXR=.1052

ENRT=.3036 ENR1=.0655 ENR2=.1815 ENR3=.0521 ENR4=.0045

197 ****************** UPHOLSTERERS ******************

RR=.7375 RR*=.6525 EXR=.1153

ENRT=.4375 ENR1=.2232 ENR2=.1563 ENR3=.0491 ENR4=.0089

198 ****************** CRAFTSMEN,N.E.C. ******************

RR=.6608 RR*=.5532 EXR=.1628

ENRT=.3785 ENR1=.1319 ENR2=.1701 ENR3=.0671 ENR4=.0093

199 ****************** ASPESTOS WK'S ******************

RR=.8031 RR*=.6951 EXR=.1345

ENRT=.4651 ENR1=.1395 ENR2=.2558 ENR3=.0531 ENR4=.0116

200 ****************** ASSEMBLERS ******************

RR=.6014 RR*=.4861 EXR=.1917

ENRT=.5300 ENR1=.2297 ENR2=.2586 ENR3=.0385 ENR4=.0033

201 ******************BOTTLING&CANNING OPRTS. ******************

RR=.6237 RR*=.4392 EXR=.2958

ENRT=.4718 ENR1=.2863 ENR2=.1411 ENR3=.0403 ENR4=.0040

202 ******************CHECKERS&INSPECTORS;MFG ******************

RR=.7211 RR*=.5833 EXR=.1910

ENRT=.4118 ENR1=.1712 ENR2=.1977 ENR3=.0367 ENR4=.0061

203 ****************** CLOTHING IRONERS ******************

RR=.7034 RR*=.5120 EXR=.2721

ENRT=.5530 ENR1=.3754 ENR2=.1633 ENR3=.0131 ENR4=.0012

204 ****************** CUTTING OPRTS.,N.E.C. ******************

RR=.6583 RR*=.5523 EXR=.1610

ENRT=.4424 ENR1=.2406 ENR2=.1642 ENR3=.0319 ENR4=.0057

205 ******************DRESSMAKERS,EXC.FACTORY ******************

RR=.8252 RR*=.5519 EXR=.3311

ENRT=.5654 ENR1=.3215 ENR2=.1840 ENR3=.0466 ENR4=.0133

206 ****************** DRILLERS, EARTH ******************

RR=.5701 RR*=.4746 EXR=.1676

ENRT=.2875 ENR1=.1086 ENR2=.1470 ENR3=.0256 ENR4=.0064

207 ****************** DRY WALL INSTALLERS ******************

RR=.7726 RR*=.6667 EXR=.1371

ENRT=.3763 ENR1=.1935 ENR2=.1398 ENR3=.0430 ENR4=.0

208 ****************** DYERS ******************

RR=.5965 RR*=.5313 EXR=.1094

ENRT=.3543 ENR1=.1890 ENR2=.1575 ENR3=.0079 ENR4=.0

209 ****************** FILERS,POLISHERS,ETC. ******************

RR=.6616 RR*=.5529 EXR=.1644

ENRT=.3961 ENR1=.2143 ENR2=.1526 ENR3=.0244 ENR4=.0049

210 ****************** HEATERS&FURNACEMEN ******************

RR=.7286 RR*=.6123 EXR=.1595

ENRT=.2915 ENR1=.1288 ENR2=.1356 ENR3=.0271 ENR4=.0

211 ****************** GARAGE WK'S ******************

RR=.3383 RR*=.3008 EXR=.1109

ENRT=.7306 ENR1=.4675 ENR2=.1821 ENR3=.0763 ENR4=.0047

212 ****************** GRADERS&SORTERS,MFG. ******************

RR=.5674 RR*=.3370 EXR=.4061

ENRT=.5000 ENR1=.3565 ENR2=.1304 ENR3=.0130 ENR4=.0

213 ******************PRODUCE GRADERS&PACKERS ******************

RR=.6159 RR*=.3544 EXR=.4246

ENRT=.6464 ENR1=.4033 ENR2=.2099 ENR3=.0276 ENR4=.0055

214 ******************DRY CLEAN OPRTS.,N.E.C. ******************

RR=.6210 RR*=.4712 EXR=.2411

ENRT=.5313 ENR1=.3542 ENR2=.1580 ENR3=.0148 ENR4=.0042

215 ****************** MEAT CUTTERS,EXC. MFG. ******************

RR=.7792 RR*=.6914 EXR=.1127

ENRT=.4248 ENR1=.2075 ENR2=.1643 ENR3=.0515 ENR4=.0014

216 ****************** MEAT CUTTERS,MFG. ******************

RR=.5720 RR*=.4911 EXR=.1415

ENRT=.4490 ENR1=.2484 ENR2=.1688 ENR3=.0318 ENR4=.0

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217 ****************** MEAT WRAPPERS,RETAIL ******************
                   RR=.7971   RR*=.5867   EXR=.2640
    ENRT=.6545  ENR1=.3780  ENR2=.2480  ENR3=.0285  ENR4=.0

218 ******************      METAL PLATERS      ******************
                   RR=.6434   RR*=.5704   EXR=.1134
    ENRT=.3642  ENR1=.1126  ENR2=.2252  ENR3=.0265  ENR4=.0

219 ******************   MINE OPRTS.,N.E.C.   ******************
                   RR=.5113   RR*=.4251   EXR=.1686
    ENRT=.3410  ENR1=.1469  ENR2=.1533  ENR3=.0396  ENR4=.0013

220 ******************      MIXING OPRTS.      ******************
                   RR=.6356   RR*=.5678   EXR=.1066
    ENRT=.3028  ENR1=.1306  ENR2=.1472  ENR3=.0222  ENR4=.0028

221 ******************OIL'S&GREAS'S,EXC. AUTO ******************
                   RR=.6467   RR*=.5320   EXR=.1773
    ENRT=.2070  ENR1=.0586  ENR2=.1250  ENR3=.0234  ENR4=.0

222 ******************     PACKERS&WRAPPERS     ******************
                   RR=.6434   RR*=.4716   EXR=.2669
    ENRT=.5786  ENR1=.3260  ENR2=.2198  ENR3=.0307  ENR4=.0022

223 ****************** PAINTERS,MFG. ARTICLES ******************
                   RR=.6807   RR*=.5838   EXR=.1423
    ENRT=.3752  ENR1=.1876  ENR2=.1580  ENR3=.0268  ENR4=.0028

224 ******************   PHOTO PROCESS WK'S   ******************
                   RR=.6639   RR*=.5391   EXR=.1879
    ENRT=.5393  ENR1=.1680  ENR2=.2520  ENR3=.1003  ENR4=.0190
```

225 ****************** DRILL PRESS OPRTS. ******************

RR=.6593 RR*=.5613 EXR=.1486

ENRT=.3904 ENR1=.1837 ENR2=.1691 ENR3=.0355 ENR4=.0021

226 ****************** GRINDING MACH. OPRTS. ******************

RR=.7431 RR*=.6508 EXR=.1242

ENRT=.2892 ENR1=.1163 ENR2=.1519 ENR3=.0194 ENR4=.0016

227 ****************** LATHE MACH. OPRTS. ******************

RR=.7207 RR*=.6285 EXR=.1279

ENRT=.2563 ENR1=.0826 ENR2=.1377 ENR3=.0335 ENR4=.0024

228 ****************** PRECISION MACH. OPRTS. ******************

RR=.6503 RR*=.5934 EXR=.0875

ENRT=.2740 ENR1=.1210 ENR2=.1256 ENR3=.0274 ENR4=.0

229 ****************** PUNCH PRESS OPRTS. ******************

RR=.6448 RR*=.5439 EXR=.1565

ENRT=.3645 ENR1=.1784 ENR2=.1639 ENR3=.0212 ENR4=.0011

230 ****************** RIVETERS&FASTENERS ******************

RR=.6083 RR*=.4679 EXR=.2308

ENRT=.4167 ENR1=.2436 ENR2=.1346 ENR3=.0385 ENR4=.0

231 ****************** SAILORS&DECKHANDS ******************

RR=.4812 RR*=.3556 EXR=.2611

ENRT=.3761 ENR1=.1966 ENR2=.1453 ENR3=.0171 ENR4=.0171

232 ****************** SAWYERS ******************

RR=.6484 RR*=.5455 EXR=.1588

ENRT=.3232 ENR1=.1831 ENR2=.1210 ENR3=.0175 ENR4=.0016

233 ****************** SEWERS&STICHERS ******************

RR=.7847 RR*=.5497 EXR=.2995

ENRT=.6891 ENR1=.4188 ENR2=.2474 ENR3=.0207 ENR4=.0022

234 ******************SHOEMAKING MACH. OPRTS. ******************

RR=.5125 RR*=.4031 EXR=.2135

ENRT=.5831 ENR1=.3909 ENR2=.1857 ENR3=.0065 ENR4=.0

235 ****************** SOLDERERS ******************

RR=.6269 RR*=.4104 EXR=.3453

ENRT=.5188 ENR1=.2406 ENR2=.2481 ENR3=.0301 ENR4=.0

236 ****************** STATIONARY FIREMEN ******************

RR=.6713 RR*=.5621 EXR=.1628

ENRT=.2029 ENR1=.0911 ENR2=.0849 ENR3=.0248 ENR4=.0021

237 ****************** KNIT'S,LOOP'S&TOP'S ******************

RR=.4422 RR*=.3274 EXR=.2596

ENRT=.5175 ENR1=.2727 ENR2=.2168 ENR3=.0280 ENR4=.0

238 ****************** SPIN'S,TWIST'S,&WIND'S ******************

RR=.6564 RR*=.5359 EXR=.1835

ENRT=.5348 ENR1=.3441 ENR2=.1830 ENR3=.0064 ENR4=.0013

239 ****************** WEAVERS ******************

RR=.6902 RR*=.5717 EXR=.1717

ENRT=.5137 ENR1=.2842 ENR2=.1967 ENR3=.0273 ENR4=.0055

240 ****************** TEXTILE OPRTS.,N.E.C. ******************

RR=.5545 RR*=.4634 EXR=.1643

ENRT=.4958 ENR1=.2844 ENR2=.1946 ENR3=.0159 ENR4=.0009

241 ****************** WELDERS&FLAMECUTTERS ******************

RR=.7462 RR*=.6559 EXR=.1210

ENRT=.3248 ENR1=.1305 ENR2=.1700 ENR3=.0218 ENR4=.0025

242 ****************** WINDING OPRTS.,N.E.C. ******************

RR=.6858 RR*=.5839 EXR=.1486

ENRT=.4843 ENR1=.2170 ENR2=.2421 ENR3=.0252 ENR4=.0

243 ****************** MACH. OPRTS.,M.S. ******************

RR=.6300 RR*=.5280 EXR=.1620

ENRT=.4091 ENR1=.1947 ENR2=.1795 ENR3=.0315 ENR4=.0035

244 ****************** MACH. OPRTS.,N.S. ******************

RR=.5293 RR*=.4495 EXR=.1507

ENRT=.4114 ENR1=.1849 ENR2=.1921 ENR3=.0321 ENR4=.0023

245 ****************** OPRTS.,M.S. ******************

RR=.5363 RR*=.4370 EXR=.1852

ENRT=.4776 ENR1=.2278 ENR2=.1901 ENR3=.0534 ENR4=.0062

246 ****************** OPRTS.,N.S. ******************

RR=.2812 RR*=.2371 EXR=.1567

ENRT=.3945 ENR1=.1932 ENR2=.1668 ENR3=.0325 ENR4=.0020

247 ****************** BUS DRIVERS ******************

RR=.7498 RR*=.6551 EXR=.1264

ENRT=.4874 ENR1=.2227 ENR2=.1983 ENR3=.0613 ENR4=.0050

248 ****************** DELIVERYMEN&ROUTEMEN ******************

RR=.6004 RR*=.5484 EXR=.0866

ENRT=.3848 ENR1=.1696 ENR2=.1407 ENR3=.0702 ENR4=.0042

249 ****************** LIFT&TOW MOTOR OPRTS. ******************

RR=.6746 RR*=.6067 EXR=.1007

ENRT=.2978 ENR1=.1303 ENR2=.1343 ENR3=.0308 ENR4=.0024

250 ****************** PARKING ATTENDANTS ******************

RR=.4793 RR*=.3990 EXR=.1675

ENRT=.6010 ENR1=.3300 ENR2=.1478 ENR3=.1133 ENR4=.0099

251 ****************** RAILROAD SWITCHMEN ******************

RR=.7523 RR*=.6905 EXR=.0821

ENRT=.3220 ENR1=.0395 ENR2=.2203 ENR3=.0621 ENR4=.0

252 ****************** TAXICAB DRIVERS ******************

RR=.6710 RR*=.5717 EXR=.1479

ENRT=.3489 ENR1=.1262 ENR2=.1305 ENR3=.0766 ENR4=.0156

253 ****************** TRUCK DRIVERS ******************

RR=.6637 RR*=.5871 EXR=.1153

ENRT=.2970 ENR1=.1391 ENR2=.1233 ENR3=.0310 ENR4=.0037

254 ******************TRANSPORT OPRTS.,N.E.C. ******************

RR=.6570 RR*=.5440 EXR=.1720

ENRT=.2041 ENR1=.0816 ENR2=.0918 ENR3=.0306 ENR4=.0

255 ****************** ANIMAL CARETAKERS ******************

RR=.5443 RR*=.4272 EXR=.2152

ENRT=.5753 ENR1=.3077 ENR2=.1773 ENR3=.0769 ENR4=.0134

256 ****************** CARPENTERS' HELPERS ******************

RR=.3897 RR*=.3180 EXR=.1841

ENRT=.4294 ENR1=.2542 ENR2=.1186 ENR3=.0480 ENR4=.0085

257 ****************** CONSTRUCTION LABORERS ******************

RR=.4364 RR*=.3489 EXR=.2006

ENRT=.4382 ENR1=.2436 ENR2=.1420 ENR3=.0487 ENR4=.0038

258 ****************** FISHERMEN&OYSTERMEN ******************

RR=.5660 RR*=.3979 EXR=.2971

ENRT=.2925 ENR1=.2170 ENR2=.0566 ENR3=.0189 ENR4=.0

259 ****************** FREIGHT HANDLERS ******************

RR=.5784 RR*=.4880 EXR=.1563

ENRT=.4528 ENR1=.2105 ENR2=.1799 ENR3=.0565 ENR4=.0059

260 ****************** GARBAGE COLLECTORS ******************

RR=.7073 RR*=.6126 EXR=.1339

ENRT=.3783 ENR1=.2513 ENR2=.0952 ENR3=.0265 ENR4=.0053

261 ****************** GROUNDSKEEPERS ******************

RR=.6768 RR*=.5249 EXR=.2244

ENRT=.4833 ENR1=.3105 ENR2=.1013 ENR3=.0644 ENR4=.0070

262 ****************** LONGSHOREMEN ******************

RR=.7650 RR*=.5970 EXR=.2196

ENRT=.3462 ENR1=.2033 ENR2=.0989 ENR3=.0330 ENR4=.0110

263 ****************** LUMBERMEN ******************

RR=.5083 RR*=.3934 EXR=.2262

ENRT=.3819 ENR1=.2605 ENR2=.0817 ENR3=.0331 ENR4=.0066

264 ****************** STOCK HANDLERS ******************

RR=.3581 RR*=.3007 EXR=.1603

ENRT=.7912 ENR1=.5133 ENR2=.1898 ENR3=.0847 ENR4=.0034

265 ******************* VEHICLE WASHERS ******************

RR=.5278 RR*=.4290 EXR=.1871

ENRT=.5740 ENR1=.3770 ENR2=.1469 ENR3=.0478 ENR4=.0023

266 ****************** WAREHOUSEMEN,N.E.C. ******************

RR=.4193 RR*=.3737 EXR=.1088

ENRT=.4084 ENR1=.1286 ENR2=.1817 ENR3=.0916 ENR4=.0064

267 ****************** LABORERS,M.S. ******************

RR=.6204 RR*=.4957 EXR=.2010

ENRT=.3918 ENR1=.2275 ENR2=.1309 ENR3=.0325 ENR4=.0009

268 ****************** LABORERS,N.S. ******************

RR=.3259 RR*=.2610 EXR=.1993

ENRT=.5220 ENR1=.2880 ENR2=.1714 ENR3=.0574 ENR4=.0051

269 ****************** FARMERS ******************

RR=.7509 RR*=.6218 EXR=.1719

ENRT=.4332 ENR1=.2376 ENR2=.1313 ENR3=.0430 ENR4=.0213

270 ****************** FARM MANAGERS ******************

RR=.5407 RR*=.4788 EXR=.1144

ENRT=.1235 ENR1=.0583 ENR2=.0280 ENR3=.0186 ENR4=.0186

271 ****************** FARM FOREMEN ******************

RR=.6564 RR*=.5458 EXR=.1685

ENRT=.1538 ENR1=.0385 ENR2=.0440 ENR3=.0495 ENR4=.0220

272 ******************FARM LABORERS,WAGE&S.E. ******************

RR=.5825 RR*=.4240 EXR=.2721

ENRT=.5991 ENR1=.4264 ENR2=.1202 ENR3=.0455 ENR4=.0070

273 ****************** FARM LABORERS,FAMILY ******************

RR=.1374 RR*=.1000 EXR=.2722

ENRT=.5605 ENR1=.3621 ENR2=.1429 ENR3=.0491 ENR4=.0065

274 ****************** CHAMBERMAIDS&MAIDS ******************

RR=.5440 RR*=.3556 EXR=.3464

ENRT=.5982 ENR1=.4289 ENR2=.1437 ENR3=.0241 ENR4=.0015

275 ****************** CLEANERS&CHARWOMEN ******************

RR=.6912 RR*=.5145 EXR=.2555

ENRT=.5304 ENR1=.3767 ENR2=.1181 ENR3=.0326 ENR4=.0030

276 ****************** JANITORS&SEXTONS ******************

RR=.6821 RR*=.5536 EXR=.1884

ENRT=.4434 ENR1=.2722 ENR2=.1084 ENR3=.0583 ENR4=.0046

277 ****************** BARTENDERS ******************

RR=.6635 RR*=.5293 EXR=.2022

ENRT=.3386 ENR1=.1054 ENR2=.1211 ENR3=.0841 ENR4=.0280

278 ****************** BUSBOYS ******************

RR=.2403 RR*=.1873 EXR=.2205

ENRT=.9273 ENR1=.7258 ENR2=.1145 ENR3=.0815 ENR4=.0055

279 ****************** COOKS,EXC. P.H. ******************

RR=.6851 RR*=.5133 EXR=.2508

ENRT=.6740 ENR1=.4151 ENR2=.1995 ENR3=.0572 ENR4=.0022

280 ****************** DISHWASHERS ******************

RR=.4351 RR*=.2851 EXR=.3447

ENRT=.8097 ENR1=.5488 ENR2=.1467 ENR3=.1093 ENR4=.0048

281 ****************** FOOD COUNTER WK'S ******************

RR=.4592 RR*=.3329 EXR=.2749

ENRT=.8104 ENR1=.4383 ENR2=.2293 ENR3=.1367 ENR4=.0062

282 ****************** WAITERS&WAITRESSES ******************

RR=.6068 RR*=.3919 EXR=.3541

ENRT=.8039 ENR1=.4516 ENR2=.2515 ENR3=.0921 ENR4=.0087

283 ****************** FOOD SERV. WK'S,N.E.C. ******************

RR=.5340 RR*=.3862 EXR=.2767

ENRT=.7426 ENR1=.4369 ENR2=.2128 ENR3=.0892 ENR4=.0038

284 ****************** DENTAL ASSISTANTS ******************

RR=.6364 RR*=.4213 EXR=.3380

ENRT=.7683 ENR1=.1550 ENR2=.4549 ENR3=.1499 ENR4=.0085

285 ******************HEALTH AIDES,EXC. NURSE ******************

RR=.5937 RR*=.4386 EXR=.2613

ENRT=.6100 ENR1=.2274 ENR2=.2482 ENR3=.1088 ENR4=.0257

286 ****************** PRACTICAL NURSES ******************

RR=.8518 RR*=.6133 EXR=.2800

ENRT=.5336 ENR1=.0933 ENR2=.3097 ENR3=.1246 ENR4=.0060

287 ****************** NURSING AIDES ******************

RR=.7080 RR*=.5209 EXR=.2642

ENRT=.7142 ENR1=.3199 ENR2=.2932 ENR3=.0936 ENR4=.0075

288 ****************** AIRLINE STEWARDESSES ******************

RR=.6604 RR*=.4118 EXR=.3765

ENRT=.6161 ENR1=.0089 ENR2=.1384 ENR3=.3527 ENR4=.1161

289 ******************ATTENDANTS&USHERS,R.&A. ******************

RR=.4073 RR*=.3169 EXP=.2220

ENRT=.7675 ENR1=.4357 ENR2=.1491 ENR3=.1696 ENR4=.0132

290 ****************** ATTENDANTS,PERSONAL ******************

RR=.6141 RR*=.4369 EXP=.2887

ENRT=.6781 ENR1=.2479 ENR2=.2452 ENR3=.1534 ENR4=.0315

291 ****************** BARBERS ******************

RR=.8476 RR*=.7494 EXP=.1158

ENRT=.4121 ENR1=.1456 ENR2=.2143 ENR3=.0467 ENR4=.0055

292 ****************** HOUSEKEEPERS ******************

RR=.6300 RR*=.4697 EXP=.2545

ENRT=.5103 ENR1=.1504 ENR2=.1534 ENR3=.1740 ENR4=.0324

293 ****************** CHILD CARE,EXC. P.H. ******************

RR=.6136 RR*=.4270 EXR=.3098

ENRT=.7189 ENR1=.3448 ENR2=.2669 ENR3=.0910 ENR4=.0162

294 ****************** ELEVATOR OPER'S ******************

RR=.6540 RR*=.4554 EXR=.3036

ENRT=.3254 ENR1=.1775 ENR2=.1065 ENR3=.0414 ENR4=.0

295 ****************** HAIRDRESSERS ******************

RR=.8636 RR*=.6448 EXP=.2533

ENRT=.7578 ENR1=.1797 ENR2=.5083 ENR3=.0666 ENR4=.0032

296 ****************** CROSSING GUARDS ******************

RR=.7352 RR*=.5942 EXP=.1917

ENRT=.5437 ENR1=.2857 ENR2=.2143 ENR3=.0357 ENR4=.0079

```
297 ******************          FIREMEN          ******************
                    RR=.8579   RR*=.8030   EXR=.0640
     ENRT=.1965  ENR1=.0281  ENR2=.1228  ENR3=.0456  ENR4=.0

298 ******************      GUARDS&WATCHMEN      ******************
                    RR=.7493   RR*=.5892   EXR=.2136
     ENRT=.2713  ENR1=.1124  ENR2=.0961  ENR3=.0506  ENR4=.0124

299 ****************** SHERIFFS,BAILIFFS,ETC. ******************
                    RR=.6559   RR*=.5848   EXR=.1083
     ENRT=.1773  ENR1=.0273  ENR2=.1000  ENR3=.0455  ENR4=.0045

300 ******************  POLICEMEN&DETECTIVES  ******************
                    RR=.7505   RR*=.6904   EXR=.0800
     ENRT=.3107  ENR1=.0332  ENR2=.1675  ENR3=.0945  ENR4=.0155

301 ******************  CHILD CARE WK'S,P.H.  ******************
                    RR=.5955   RR*=.3443   EXR=.4219
     ENRT=.8037  ENR1=.5329  ENR2=.2086  ENR3=.0545  ENR4=.0077

302 ******************        COOKS,P.H.       ******************
                    RR=.6410   RR*=.4281   EXR=.3322
     ENRT=.3533  ENR1=.2717  ENR2=.0598  ENR3=.0217  ENR4=.0

303 ******************    HOUSEKEEPERS,P.H.    ******************
                    RR=.6488   RR*=.4498   EXR=.3068
     ENRT=.5453  ENR1=.4149  ENR2=.1017  ENR3=.0270  ENR4=.0016

304 ******************   MAIDS&SERVANTS,P.H.   ******************
                    RR=.7713   RR*=.5361   EXR=.3049
     ENRT=.6637  ENR1=.5037  ENR2=.1303  ENR3=.0255  ENR4=.0042
```

APPENDIX C

CLUSTER REFERENCE SYSTEM

Appendix C

Cluster Reference System Explanatory Note

The following system was devised to facilitate location of any given occupation category in each of the eight cluster configurations. A two integer code is used to identify the page of the cluster configuration and the position of the occupation on the page. For example, in Cluster Configuration I (C.C.I), Accountants are located on the third page, column thirty-eight.

Columns of the Cluster Reference System correspond to the following representations:

Cluster Configuration	Mobility Matrix	Diagonal Value	Distance Metric
C.C.I:	P-matrix	Retention Rates	City-Block
C.C.II:	P-matrix	1.0	City-Block
C.C.III:	P-matrix	.2805	Euclidean
C.C.IV:	P-matrix	1.0	Euclidean
C.C.V:	R-matrix	Not-Considered	City-Block
C.C.VI;	R-matrix	1.0	City-Block
C.C.VII:	R-matrix	.6145	Euclidean
C.C.VIII:	R-matrix	1.0	Euclidean

In Appendix D, each of the cluster configurations is presented in the above order.

Appendix C (continued)

Occupation	I	II	III	IV	V	VI	VII	VIII
ACCOUNTANTS	3,38	5,19	2,38	6,38	5,25	6,38	4, 8	5,24
ARCHITECTS	2,48	5,50	4,19	5, 2	1,28	1,40	6, 9	6, 2
COMPUTER PROGRAMMERS	2,31	6, 4	1,19	6,45	1,44	1,31	6,11	6,25
COMPUTER SPECIALISTS	2,32	6, 3	1,18	6,46	1,43	1,32	6,10	6,26
AERONAUTICAL ENGINEERS	2,41	5,35	1,42	4,50	1,27	1,35	6,13	6,19
CHEMICAL ENGINEERS	2,47	5,30	1,45	5,10	1,20	1,23	1,19	1,22
CIVIL ENGINEERS	2,39	5,34	1,32	5,22	1,26	1,39	6,18	6,18
ELECTRICAL ENGINEERS	2,40	5,32	1,41	4,51	1,23	1,37	6,17	6,22
INDUSTRIAL ENGINEERS	2,34	5,31	1,39	5,15	1,22	1,34	6,15	6,23
MECHANICAL ENGINEERS	2,42	5,33	1,43	5,16	1,24	1,36	6,14	6,20
ENGINEERS,M.S.	2,46	5,29	1,44	5,25	1,21	1,29	1,21	1,20
SALES ENGINEERS	2,45	5, 7	2,15	5,26	1,41	1,11	6, 7	6,44
ENGINEERS,N.E.C.	2,35	5,36	1,40	5, 1	1,25	1,38	6,16	6,21
FORESTERS	2,22	3,35	1,34	5,20	2,33	2, 1	6,26	6,28
LAWYERS&JUDGES	2, 8	4, 4	4, 3	5,24	1, 5	1,18	1,18	1,19
LIBRARIANS	1,24	4,39	6,31	6,16	4,50	1,44	6,31	6, 1
MATH SPECIALISTS	2,29	6, 1	1,51	6,44	1,13	1,17	1,13	1,15
BIOLOGICAL SCIENT'S	2,19	5,47	2, 8	4,45	1,11	1,16	1,17	1,10
CHEMISTS	2,23	5,48	1,49	5,11	1,12	1,14	1,20	1,21
PHYSICISTS&ASTRONOMERS	2,20	5,49	2, 5	4,49	1, 1	1,23	1,27	1, 9
LIFE&PHYSICAL SCIENT'S	2,21	5,51	1,33	5,21	1,19	1,30	6,27	6,29
OPERATIONS RESEARCHERS	2,33	5,38	2,14	6,47	1,42	1,33	6,12	6,24
PERSONNEL&LAB.REL.WK'S	1,47	4,17	4,21	5,44	5,28	6,41	4,12	6,39
DENTISTS	1, 1	4, 5	4, 5	2, 6	1, 3	1,21	1,24	1, 6
PHARMACISTS	1,27	4, 8	3,51	1,24	1, 8	1,19	1,22	1,12
PHYSICIANS	1, 2	4, 6	4, 1	1,19	1, 2	1,20	1,23	1,11
HEALTH PRACT.,N.E.C.	1,26	4, 7	4,26	2,22	1, 4	1,22	1,25	1, 7
DIETITIANS	1, 3	6,20	3,21	1,23	2,34	2, 2	3, 3	3,13
REGISTERED NURSES	1, 7	6,18	3,16	1,15	3,49	3,31	2,14	2, 1
THERAPISTS	1, 4	6,19	3,17	1,14	1,16	1,46	1,12	1,14
CLINICAL LAB. TECH'S	1, 6	6,21	3,19	1,21	3,51	4, 2	6,43	5,42
RADIOLOGIC TECH'S	6,46	4,10	4, 4	1,20	4, 1	4, 3	1,37	1,51
HEALTH TECH'S,N.E.C.	1, 5	6,22	3,18	1,13	3,50	4, 1	6,42	5,41
CLERGYMEN	1,25	4,37	1,28	6, 8	1,15	1,12	6,28	6,33
RELIGIOUS WK'S	1,21	4,44	1,27	6, 9	4,48	1,42	6,29	6,32
ECONOMISTS	2,12	5, 8	2,13	5,49	2, 2	1, 4	6,20	6,35
PSYCHOLOGISTS	1,10	4,36	2, 9	4,48	1,18	1,27	1,16	1,18
SOCIAL SCIENT'S,N.E.C.	2,18	3,34	2, 3	4,43	1,14	1,13	1,14	1,16
SOCIAL WK'S	1,19	4,40	1,29	5,47	1,17	1,47	1,15	1,17
RECREATION WK'S	1,20	4,30	1,30	5,46	4, 4	2,34	6,38	5,45
TEACHERS, COLLEGE&UNIV.	1,11	4,38	2, 7	4,47	1,10	1,26	1,11	1,23
ADULT ED. TEACHERS	1,12	4,43	2,12	5,48	5, 1	1,48	6,25	6,27
ELEMENTARY SCH.TEACHERS	1,13	4,32	6,29	6,13	1, 7	1,25	1, 8	1,27
KINDERGARTEN TEACHERS	1, 9	4,31	6,28	6,14	4,51	1,45	6,30	1,13
SECONDARY SCH. TEACHERS	1,14	4,33	6,30	6,12	1, 6	1,24	1, 7	1,26
TEACHERS,N.E.C.	1,18	4,41	4,27	5,36	4,49	1,43	6,36	5,47
AG.&BIO. TECH'S	2,27	4,20	1,50	2,23	4,43	2,42	6,40	5,43
CHEMICAL TECH'S	2,24	5,46	1,48	5,12	4,44	2,43	5,48	6, 9
DRAFTSMEN	2,43	5,43	[illegible]	5, 3	4,46	2,45	6, 6	6, 3
ELECTRICAL ENG. TECH'S	2,36	5,42	1,37	5,17	[illegible]	2,51	2,12	2, 8
IND.&MECH. ENG. TECH'S	2,28	5,37	1,46	5,14	5,30	2,46	5,46	6, 7
SURVEYORS	6,21	5,28	1,31	5,23	3,36	6,10	5,44	6,17
ENG.&SCI. TECH'S,N.E.C.	2,37	5,45	1,47	5,13	4,45	2,44	5,47	6, 8
PILOTS&FLIGHT ENGINEERS	2, 7	4, 3	4, 7	2, 5	1,45	1,51	4,20	6,15
AIR TRAFFIC CONTROLLERS	2, 4	4, 2	3,10	1,45	5,13	3, 2	5,42	6, 4
RADIO OPERATORS	1,50	3,32	4,42	1,34	4,39	3,12	5,49	5,13
TECHNICIANS,N.E.C.	2,38	5,27	1,38	5, 6	4,40	2,47	5,45	6, 6
VOC.&ED. COUNSELORS	1,15	4,34	2,10	6,10	2, 4	1, 2	1, 9	1,25
ATHLETES&KINDRED WK'S	3,20	4,47	4,30	1,26	4, 5	2,37	6,39	5,44
AUTHORS	2,17	6, 2	2, 2	6, 5	1,46	1,49	6,24	6,30

Appendix C (continued)

Occupation	I	II	III	IV	V	VI	VII	VIII
DESIGNERS	2,44	5,44	4,17	5, 4	1,49	1,41	4,18	6,13
EDITORS&REPORTERS	2,16	5,23	2, 1	6, 6	1,47	1,50	6,23	6,31
MUSICIANS&COMPOSERS	1,17	4,42	4,28	5,35	4, 3	2,36	6,37	5,46
PAINTERS&SCULPTORS	2, 9	3,41	3,42	5, 5	1,48	2,40	4,19	6,14
PHOTOGRAPHERS	2,11	3,42	3,43	1,39	4,42	2,41	5,13	5, 9
PUBLIC RELATIONS MEN	2,15	5,22	1,23	6, 1	1,51	1, 6	6,22	6,37
RADIO&T.V. ANNOUNCERS	2,14	5,24	1,21	5,51	4, 2	2,38	6,34	5,49
WRITERS&ENTERT'S,N.E.C.	2,25	5,21	4,29	5,34	4,41	2,39	6,35	5,48
RESEARCH WK'S,N.E.C.	2,26	5,26	2, 6	4,46	1, 9	1,15	1,26	1, 8
ASSESSORS,ETC.,LOC.PUB.	3,39	6,38	2,35	1,31	5,14	6,44	4, 6	5,22
BANK OFFICERS&FIN.MGRS.	3,36	5,18	2,34	6,39	5,24	6,37	4, 7	5,23
BUYERS,WHOLESALE&RETAIL	1,33	4,49	2,19	5,30	1,32	6,33	6, 3	5,37
CREDIT MEN	3,33	5,17	2,31	6,35	5,22	6,35	4, 4	5,29
FUNERAL DIR.&EMBALMERS	1,49	4,14	4, 2	3,20	1,29	2,32	4,17	6,10
HEALTH ADMINISTRATORS	1,45	4,18	4,22	1,18	1,31	6,43	4,16	6,40
INSPECTORS, PUB.ADMIN.	2, 2	6,41	4,25	1,44	5, 4	5,40	4,15	5,18
MGRS.&SUPT'S,BUILDING	1,44	4,15	4,24	5,39	5, 5	4, 7	5,36	5,32
OFFICE MGRS.,N.E.C.	3,37	5,20	2,36	6,36	5,23	6,36	4, 9	5,25
OFFICERS,ETC.;SHIP	1,48	3,43	5, 7	3,32	6,45	5,35	3,49	4, 3
OFFICIALS;PUB.ADMIN.	3,30	6,40	2, 4	4,44	5,27	6,40	4,14	5,19
OFFICIALS; LODGES, ETC.	1,46	4,16	4,20	5,45	1,30	6,45	4,13	6,38
POSTMASTER&MAIL SUPT'S	3,40	3,48	3,13	1,41	5, 2	6,46	6,46	6,46
PURCHASING AGENTS	1,42	5,11	5,30	5, 9	5,29	6,42	4,11	5,26
RAILROAD CONDUCTORS	3,44	4,23	2,45	4,41	6,49	6,47	1,30	1,31
RESTAURANT,ETC. MGRS.	5, 4	6,26	3,31	4,18	5, 7	4, 6	5,39	4,41
SALES MGRS.,RETAIL	1,34	4,48	2,20	5,31	1,33	6,34	3,46	5,38
SALES MGRS.,EXC.RETAIL	1,40	5, 6	2,17	5,28	1,40	1,10	6, 5	6,42
SCH. ADMIN.,COLLEGE	2,13	5,25	1,26	6, 2	2, 3	1, 3	1,10	1,24
SCH. ADMIN.,ELEM.&SEC.	1,16	4,35	2,11	6,11	2, 5	1, 1	1, 6	1,28
MGRS.&ADMIN.,SAL.	1,32	5, 1	1,25	6, 3	1,38	6,32	6, 2	5,35
MGRS.&ADMIN.,S.E.	1,31	4,51	1,24	6, 4	1,39	6,31	6, 1	5,36
ADVERTISING AGENTS	1,41	5, 9	1,22	5,50	1,50	1, 7	6,21	6,36
DEMONSTRATORS	3,19	6,27	2,40	1,29	4,10	3,36	1,41	1,38
HUCKSTERS&PEDDLERS	3,22	5, 3	2,24	5,37	4,15	3,37	1,40	1,39
INSURANCE AGENTS	1,37	5,13	2,29	5,42	5,18	3,10	4, 1	6,11
NEWSBOYS	3,23	4,28	4,32	1,27	2, 9	2, 6	1, 1	1, 1
REAL ESTATE AGENTS	1,43	5,14	4,23	5,40	5,17	3, 9	5,37	5,33
STOCK&BOND SALESMEN	1,28	5,12	2,27	6,43	2, 1	1, 5	6,19	6,34
SALES REP'S,MFG.	1,38	5, 4	2,16	5,27	1,37	1, 9	6, 6	6,43
SALES REP'S,WHOLESALE	1,39	5, 5	2,18	5,29	1,36	1, 8	6, 4	6,41
SALES CLERKS, RETAIL	3,28	6,43	2,21	5,32	4,14	3,45	3,45	5,39
SALESMEN, RETAIL	1,35	4,50	2,22	3, 6	1,34	4, 9	3,47	5,34
SALESMEN,SERV.&CONST.	1,36	5, 2	2,23	3, 5	1,35	4, 8	5,38	6,12
BANK TELLERS	3,16	6,37	2,33	6,40	4,25	3,27	1,46	1,47
BILLING CLERKS	3, 6	6,32	6,40	6,23	4,33	3,15	2, 2	2,16
BOOKKEEPERS	3,15	6,36	2,37	6,37	4,34	3,22	1,47	1,46
CASHIERS	3,27	6,44	6,20	4,15	4,16	3,44	3,35	3,28
CLERICAL SUPERVISORS	3,31	6,39	2,39	5, 7	5,26	6,39	3,51	5,20
COLLECTORS, BILL&ACCT.	3,34	6,48	2,32	6,34	5,21	3, 5	4, 5	5,28
COUNTER CLERKS,EXC.FOOD	3,26	6,45	4,35	4,14	4,13	3,48	2,47	3, 3
DISPATCHERS,VEHICLE	3,29	4,19	5,32	5,41	5,12	4,10	5, 5	4,43
ENUMERAT'S&INTERVIEW'S	3,32	6,49	2,25	6,41	3,46	3,38	2, 8	2,11
ESTIMAT'S&INVESTIGAT'S	3,35	5,15	2,26	6,42	5,16	3, 8	4, 3	5,30
EXPEND.&PROD.CONTROL'S	6,22	5,39	5,31	5, 8	5,19	3, 7	4,10	5,27
FILE CLERKS	3,10	6,31	6,35	6,28	4,28	3,19	1,39	2,14
INSURANCE ADJUST'S,ETC.	1,29	5,16	2,30	5,43	5,15	3,11	4, 2	5,31
LIBRARY ATTENDANTS	1,23	4,46	6,32	6,17	3,48	2,35	6,32	5,51
MAIL CARRIERS, P.O.	6, 8	3,47	3,11	1,43	5, 8	3, 3	5,43	2, 6
MAIL HANDLERS,EXC.P.O.	3,13	6,46	4,37	1,12	4,36	3,49	2,49	2, 5
MESSENGERS&OFFICE BOYS	3,24	6,47	4,38	1,11	3,18	3,50	2,50	3, 1
METER READERS	4,39	1,12	5,36	3,22	3,37	6,11	5,26	5, 3

Appendix C (continued)

Occupation	I	II	III	IV	V	VI	VII	VIII
OFFICE MACHINE:BILLING	3, 5	6, 6	6,44	6,18	4,24	3,26	1,48	1,45
OFFICE MACHINE:CALC.	3,17	6, 7	6,42	6,21	4,30	3,16	1,49	1,42
COMPUTER OPERATORS	2,30	6, 5	1,20	6,20	4,38	3,17	1,50	1,41
KEY PUNCH OPERATORS	3, 4	6,33	6,43	6,19	4,23	3,25	1,33	1,44
OFFICE MACHINE,N.E.C.	3,18	6,28	4,36	1,10	4,37	3,18	1,38	2,15
PAYROLL CLERKS	3,14	6,35	6,41	6,22	4,31	3,13	2, 4	2,19
POSTAL CLERKS	6, 7	3,46	3,12	1,42	5, 9	3, 4	6,45	6,45
PROOFREADERS	3, 3	6,42	2,28	6, 7	4,20	3,30	2, 7	2,13
RECEPTIONISTS	3, 7	6,12	6,34	6,29	4,26	3,21	1,44	1,36
SECRETARIES	2,50	6,10	6,48	6,48	4,22	3,28	1,35	1,49
SHIPPING CLERKS	6,26	1, 7	4,43	3,15	5,11	4,29	5,22	4,50
STATISTICAL CLERKS	3, 9	6,30	6,37	6,24	4,32	3,14	2, 5	2,18
STENOGRAPHERS	2,51	6, 9	6,49	6,49	4,21	3,29	1,34	1,50
STOCK CLERKS	6,23	1, 6	4,34	3,16	5,10	4,28	2,48	3, 4
TEACHER AIDES	1,22	4,45	6,27	6,15	3,47	3,39	1,45	1,37
TELEPHONE OPERATORS	3, 8	6,34	6,33	6,30	4, 8	3,34	1,43	1,35
TICKET&EXPRESS AGENTS	1,30	5,10	2,43	6,33	5,20	3, 6	5,41	6, 5
TYPISTS	3, 1	6,11	6,39	6,26	4,29	3,20	1,36	1,48
WEIGHERS	4,41	1,13	5,41	2,30	3, 3	4,27	5,23	3,10
CLERICAL WK'S,M.S.	3,12	6,29	6,36	6,25	4,35	3,24	2, 6	2,17
CLERICAL WK'S,N.S.	3,11	6, 8	6,38	6,27	4,27	3,23	2, 3	5,21
BAKERS	4,48	3,13	5,12	2,35	3,16	5,29	3, 9	3, 6
METAL CRAFTSMEN,M.S.	4,11	2,18	5,20	2,49	6,18	5,50	4,40	4,38
BOILERMAKERS	4, 8	1,47	3, 9	3,40	5,45	6,29	4,26	4,20
BOOKBINDERS	5,22	3, 7	6, 9	1,35	2,38	4,36	5,34	3, 5
BRICKMASONS	6,31	2,10	3,38	2,11	6,27	4,49	3,44	4, 1
BULLDOZER OPERATORS	4,14	2, 5	5,27	2,36	6,23	6, 8	4,31	4, 7
CABINETMAKERS	6,15	2,20	2,51	3, 4	6,14	5,46	2,34	4,19
CARPENTERS&FLOOR LAYERS	6,14	2, 9	1, 8	4,27	6,12	4,22	2,33	4,18
CARPET INSTALLERS	3,46	1,26	3,40	2,13	6,33	4,39	2,30	2,39
CEMENT&PLASTER WK'S	6,30	2, 7	3,39	2,12	6,25	6, 9	3,42	3,50
COMPOSITORS&TYPESETTERS	5,51	3,38	2,48	1,36	3,28	4,35	5,11	5,11
CRANEMEN&DERRICKMEN	4,12	2,17	5,28	3,37	6,22	6, 6	4,33	4, 9
DECOR'S&WINDOW DRESSERS	5,39	3,40	4,16	5,33	2,35	3,40	2, 9	2,12
DENTAL LAB. TECH'S	2, 3	4, 9	4, 6	2, 7	3,45	3,51	6,41	5,40
ELECTRICIANS	6, 2	1,40	5,34	1, 7	3,30	4,19	5,28	5, 5
ELECTRIC POWER LINEMEN	6, 3	1,34	5,35	1, 6	3,34	4,17	5,27	5, 4
PRINTING CRAFTSMEN,M.S.	6, 1	3,36	2,50	1,38	3,26	4,33	5,12	5,10
EXCAVATING MACH. OPER'S	4,13	2, 6	5,26	2,37	6,24	6, 7	4,32	4, 8
FOREMEN,N.E.C.	6,27	1,39	3, 6	3,43	5,38	5,45	4,51	4,27
GLAZIERS	5,41	1,21	3,33	1,47	3,35	4,24	5,35	5, 7
INSPECTORS,N.E.C.	6,20	1,33	3,47	2, 2	5,37	5,44	5, 1	4,25
JEWELERS&WATCHMAKERS	5,37	3,51	4,15	1,30	2,37	4,37	5,29	2,51
JOB&DIE SETTERS,METAL	5,44	1,16	3, 1	2,47	5,47	6,17	4,44	4,35
LOCOMOTIVE ENGINEERS	3,41	4,24	2,47	4,39	6,48	6,49	1,28	1,29
BRAKEMEN&FIREMEN,R.R.	3,43	4,25	2,46	4,40	5,33	6,48	1,29	1,30
MACHINISTS	5,47	1,19	3, 4	2,44	5,50	6,20	4,46	4,31
MECHANICS:A.C.,ETC.	6,12	1,28	4, 9	2, 1	5,44	6, 2	5,18	4,14
MECHANICS,AIRCRAFT	6, 9	1,36	4, 8	2, 4	3,42	2,50	4,21	6,16
AUTO BODY REPAIRMEN	6,34	1,30	3,34	1,46	6, 5	4,16	2,16	2,20
AUTOMOBILE MECHANICS	6,33	1,31	4,47	3,27	6, 4	4,15	2,17	2,21
COMPUTER REPAIRMEN	2, 5	5,41	1,35	5,19	3,44	3, 1	2,13	2, 7
MECHANICS,FARM IMP.	4, 7	1,11	1,11	4,24	6, 3	4,14	2,18	4,13
MECHANICS,HEAVY EQUIP.	4, 5	1,45	1,12	4,25	5,43	6,25	4,23	4,23
MECHANICS,H.H.APPLIANCE	6,13	1,29	5,37	3,23	3,31	4,20	5,25	5, 2
OFFICE MACH. REPAIRMEN	2, 6	5,40	3,45	3, 7	3,40	2,48	2,10	2,10
RADIO&T.V. REPAIRMEN	6,11	1,27	1,36	5,18	3,41	2,49	2,11	2, 9
MECHANICS,R.R.&CAR SHOP	4, 3	1,32	3,46	2, 3	5,32	6,15	5, 2	4,26
MECHANICS&REPAIRMEN,M.S	6,10	1,42	5,40	2,29	3,29	4,18	5,17	5, 6
MECHANICS&REPAIRMEN,N.S	4, 6	1,10	1,13	4,26	5,42	6,26	5,16	5, 1
MILLWRIGHTS	4, 4	1,44	1,14	3,44	5,46	6,30	4,22	4,24

Appendix C (continued)

Occupation	I	II	III	IV	V	VI	VII	VIII
OPTICIANS	5,40	4, 1	3,50	5,38	2,39	4,25	5,33	2,48
PAINTERS,CONST.&MAINT.	6,32	2, 8	5,15	3, 2	6,31	4,44	2,32	4,17
PATTERN&MODEL MAKERS	5,42	1,23	3,48	1,48	5,31	6,16	4,50	4,28
PLUMBERS&PIPE FITTERS	6,29	1,41	4,10	1,51	3,32	4,21	5,19	4,15
PRESSMEN&PLATE PRINTERS	5,50	3,37	2,49	1,37	3,27	4,34	5,10	5,12
ROFFERS&SLATERS	4,16	2,21	3,37	2,10	6,30	4,46	4,38	2,25
SHEETMETAL WK'S	6,18	1,38	3,36	2, 9	3,33	6, 3	4,37	2,24
STATIONARY ENGINEERS	6,28	1,35	5,24	2,39	5,39	6,27	4,27	4,11
STRUCTURAL METAL WK'S	6,19	1,46	3, 7	3,42	6,21	6, 1	4,24	4,22
TAILORS	5,19	3,15	4,13	2,20	3, 6	5,34	3,15	3,14
TELEPHONE INSTALLERS	6, 5	4,26	1, 4	1, 9	3,39	6,13	1,51	2, 4
TELEPHONE LINEMEN	6, 4	4,27	1, 3	1, 8	3,38	5,12	2, 1	2, 3
TILE SETTERS	3,47	1,25	3,41	2,14	6,26	4,38	2,29	2,40
TOOL&DIE MAKERS	5,43	1,22	3,49	1,49	6, 2	6,18	4,49	4,29
UPHOLSTERERS	5,18	3,14	4,12	2,19	3, 5	5,32	3,14	3,19
CRAFTSMEN,N.E.C.	6,16	1,43	6, 4	3,21	6,10	4,23	5,32	2,49
ASPESTOS WK'S	4, 9	2,15	4,11	1,50	2,40	4,26	5,31	3, 9
ASSEMBLERS	5,28	2,50	6, 8	3,48	3, 1	5,12	2,41	2,42
BOTTLING&CANNING OPRTS.	5,25	2,44	5, 9	2,32	3, 8	5,20	3,11	3,22
CHECKERS&INSPECTORS;MFG	5,24	2,42	6, 6	3,46	3, 2	5,11	2,42	2,43
CLOTHING IRONERS	5, 7	3,11	3,28	2,18	2,23	2,21	3,19	3,38
CUTTING OPRTS.,N.E.C.	5,27	2,49	6,10	3,50	2,49	5,15	3,13	3,21
DRESSMAKERS,EXC.FACTORY	6,36	3,16	4,14	2,21	2,29	5,33	3,17	3,16
DRILLERS, EARTH	4,35	2,23	5,22	2,41	6,20	6, 5	4,35	2,22
DRY WALL INSTALLERS	3,48	1,24	3,35	2, 8	6,29	4,45	4,36	2,23
DYERS	5,17	2,35	5,38	2,31	3,25	5, 4	2,39	2,26
FILERS,POLISHERS,ETC.	4,36	2,47	5,19	2,50	2,50	5,14	2,38	2,27
HEATERS&FURNACEMEN	4,10	2,16	5,21	2,48	6,19	5,51	4,39	4,39
GARAGE WK'S	4,32	2,31	4,48	3,28	2,12	2,10	3,27	3,36
GRADERS&SORTERS,MFG.	5,35	3, 8	5,46	2,27	3, 9	2,27	3,23	3,43
PRODUCE GRADERS&PACKERS	5,12	3, 9	5,47	2,26	2,25	2,23	3,24	3,44
DRY CLEAN OPRTS.,N.E.C.	5, 6	3,10	3,27	2,17	2,22	2,20	3,20	3,39
MEAT CUTTERS,EXC. MFG.	5,38	3,50	5,50	3,24	3, 4	5,31	2,36	3, 8
MEAT CUTTERS,MFG.	4,21	2,39	5,51	3,25	3,10	5,30	2,37	3, 7
MEAT WRAPPERS,RETAIL	6,45	3,49	3,30	1,28	2,24	2,22	3,36	3,27
METAL PLATERS	5,10	2,19	5,16	3, 1	2,44	4,32	5,30	2,50
MINE OPRTS.,N.E.C.	4,34	2,24	5,23	2,40	6,37	6, 4	5, 9	4, 6
MIXING OPRTS.	4,31	2,45	5,13	2,25	6,17	5,49	5,24	2,28
OIL'S&GREAS'S,EXC. AUTO	4,15	2,22	5,25	2,38	5,41	6,24	4,34	4,10
PACKERS&WRAPPERS	5,26	2,43	3,29	4,20	2,28	2,26	3,10	3,11
PAINTERS,MFG. ARTICLES	4,38	2,48	5,14	3, 3	6,32	4,43	2,31	4,16
PHOTO PROCESS WK'S	2,10	3,39	3,44	1,40	2,36	3,41	5,14	5, 8
DRILL PRESS OPRTS.	5,48	1,15	3, 2	2,46	6, 1	6,23	4,41	4,34
GRINDING MACH. OPRTS.	5,49	1,17	5,17	2,42	5,51	6,22	4,42	4,37
LATHE MACH. OPRTS.	5,45	1,18	3, 3	2,45	5,49	6,19	4,45	4,30
PRECISION MACH. OPRTS.	5,46	1,20	3, 5	2,43	5,48	6,21	4,47	4,32
PUNCH PRESS OPRTS.	4,37	3, 2	5,18	2,51	2,45	5,19	4,43	4,36
RIVETERS&FASTENERS	5,11	3, 6	6,14	3,49	3, 7	5,21	3,12	3,20
SAILORS&DECKHANDS	4,19	2,26	5, 6	3,35	6,34	5,37	3,50	4, 2
SAWYERS	4,24	2,46	5, 5	3,38	6,36	4,42	2,19	2,38
SEWERS&STICHERS	5,20	2,41	6, 2	3,19	2,27	2,25	3,16	3,15
SHOEMAKING MACH. OPRTS.	5,34	3, 4	6, 3	3,20	2,26	2,24	3,18	3,42
SOLDERERS	5,36	3, 5	6, 7	3,47	2,42	5, 9	2,40	2,41
STATIONARY FIREMEN	5,21	1,48	6, 1	3,18	5,40	6,28	4,28	4,12
KNIT'S,LOOP'S&TOP'S	5,14	2,34	1,17	4,21	3,21	5, 8	3, 7	3,23
SPIN'S,TWIST'S,&WIND'S	5,16	2,37	1,15	4,23	3,23	5, 7	3, 6	3,24
WEAVERS	5,13	2,38	5,39	2,28	3,24	5, 5	3, 4	3,26
TEXTILE OPRTS.,N.E.C.	5,15	2,36	1,16	4,22	3,22	5, 6	3, 5	3,25
WELDERS&FLAME CUTTERS	6,17	1,37	3, 8	3,41	6,15	5,47	4,25	4,21
WINDING OPRTS.,N.E.C.	5,23	2,40	6, 5	3,45	2,43	5,10	2,46	2,47
MACH. OPRTS.,M.S.	5,32	2,51	6,12	4, 1	2,47	5,17	2,43	2,44

Appendix C (continued)

Occupation	I	II	III	IV	V	VI	VII	VIII
MACH. OPRTS.,N.S.	5,33	3, 3	6,11	4, 2	2,46	5,18	4,48	4,33
OPRTS.,M.S.	5,29	3, 1	5,11	2,34	2,51	5,13	2,45	2,46
OPRTS.,N.S.	5,30	1, 9	6,13	3,51	2,48	5,16	2,44	2,45
BUS DRIVERS	4,43	2, 1	5,42	3, 8	6, 6	5,27	5, 3	4,45
DELIVERYMEN&ROUTEMEN	4,45	1,49	5,45	3,10	6, 7	4,13	5, 7	4,46
LIFT&TOW MOTOR OPRTS.	4,30	2, 2	4,45	3,13	6,16	5,48	5,20	4,48
PARKING ATTENDANTS	4,17	2,32	4,46	3,26	3,19	5,23	3,26	3,35
RAILROAD SWITCHMEN	3,42	4,22	2,44	4,42	5,34	6,14	1,31	1,32
TAXICAB DRIVERS	4,44	1,51	5,43	3,12	6, 8	4,11	5, 4	4,44
TRUCK DRIVERS	4,46	1,50	5,44	3, 9	6,11	4,12	5, 6	4,47
TRANSPORT OPRTS.,N.E.C.	4,40	4,21	5,33	3,11	6,44	5,38	5, 8	4, 5
ANIMAL CARETAKERS	4,18	1,14	5,48	2,24	3,20	5,22	3,25	3,18
CARPENTERS' HELPERS	4,29	2,33	1, 9	4,28	6,28	4,47	2,28	2,32
CONSTRUCTION LABORERS	4,33	2,28	1,10	4,29	3,11	4,48	3,43	3,51
FISHERMEN&OYSTERMEN	4,20	2,25	5, 8	3,31	6,35	5,36	3,48	4, 4
FREIGHT HANDLERS	4,27	2, 3	5, 1	4,33	6,38	4,50	2,23	2,34
GARBAGE COLLECTORS	4,42	2,13	4,51	4,32	6,40	5, 2	2,27	2,29
GROUNDSKEEPERS	4,23	2,12	4,49	4,30	3,14	5,25	2,25	2,31
LONGSHOREMEN	3,45	2,14	5,29	3,36	6,42	4,40	2,24	2,33
LUMBERMEN	4,28	2,27	5, 4	3,39	6,41	4,41	2,20	2,37
STOCK HANDLERS	6,24	1, 5	4,33	3,17	2,13	2,11	1, 4	1, 5
VEHICLE WASHERS	4,25	2,30	5,10	2,33	3,15	5,24	3,28	3,37
WAREHOUSEMEN,N.E.C.	6,25	1, 8	4,44	3,14	6, 9	4,30	5,21	4,49
LABORERS,M.S.	4,26	2, 4	5, 3	4,35	6,39	5, 1	2,21	2,36
LABORERS,N.S.	5,31	2,29	5, 2	4,34	3,12	4,51	2,22	2,35
FARMERS	3,49	1, 2	1, 2	1, 2	2,32	2,30	6,48	6,48
FARM MANAGERS	4, 1	3,30	1, 5	4,36	6,47	2,31	6,49	6,49
FARM FOREMEN	4, 2	3,31	1, 7	4,38	6,46	2,28	3,40	3,48
FARM LABORERS,WAGE&S.E.	3,51	1, 3	1, 6	4,37	2,31	2,29	3,41	3,49
FARM LABORERS,FAMILY	3,50	1, 1	1, 1	1, 1	2,30	2, 8	6,47	6,47
CHAMBERMAIDS&MAIDS	6,41	3,25	6,17	4,10	2,20	2,18	3,21	3,40
CLEANERS&CHARWOMEN	5, 8	3,12	6,16	4,11	2,21	2,19	3,22	3,41
JANITORS&SEXTONS	4,22	2,11	4,50	4,31	3,13	5,26	2,26	2,30
BARTENDERS	5, 5	6,25	3,32	4,19	5, 6	4, 5	5,40	4,42
BUSBOYS	4,49	1, 4	6,23	4, 6	2,10	2, 7	1, 2	1, 2
COOKS,EXC. P.H.	4,51	3,20	6,25	4, 4	2,19	2,17	3,32	3,31
DISHWASHERS	4,50	3,18	6,26	4, 3	2,14	2,12	1, 3	1, 4
FOOD COUNTER WK'S	5, 2	3,22	6,21	4,16	2,17	2,15	3,30	3,33
WAITERS&WAITRESSES	5, 3	3,21	6,22	4,17	2,16	2,14	3,31	3,32
FOOD SERV. WK'S,N.E.C.	5, 1	3,19	6,24	4, 5	2,18	2,16	3,33	3,30
DENTAL ASSISTANTS	3, 2	6,13	2,41	6,31	4, 9	3,35	1,42	1,34
HEALTH AIDES,EXC. NURSE	6,43	6,15	3,20	1,22	4,11	3,47	3, 1	1,41
PRACTICAL NURSES	1, 8	6,17	3,15	1,16	4,19	3,32	2,15	2, 2
NURSING AIDES	6,44	6,16	3,14	1,17	4,17	3,43	3, 2	1,40
AIRLINE STEWARDESSES	2,49	6,14	2,42	6,32	4,47	2,33	6,44	5,50
ATTENDANTS&USHERS,R.&A.	3,21	4,29	4,31	1,25	2,11	2, 9	3,29	3,34
ATTENDANTS,PERSONAL	3,25	6,24	3,26	3,29	4,12	3,46	2,51	3, 2
BARBERS	[illegible]	[illegible]	[illegible]	[illegible]	2,41	4,51	[illegible]	[illegible]
HOUSEKEEPERS	6,42	2,26	6,15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CHILD CARE,EXC. P.H.	6,39	3,23	6,19	4, 8	4,18	3,42	3,34	3,29
ELEVATOR OPER'S	5, 9	3,17	5,49	4, 7	6,43	5, 3	2,35	3,12
HAIRDRESSERS	6,37	4,11	3,24	2,16	4, 7	3,33	1,32	1,33
CROSSING GUARDS	6,38	6,23	3,22	4,13	3,17	5,28	3, 8	3,17
FIREMEN	6, 6	4,13	3,23	3,33	5,36	5,43	4,30	5,16
GUARDS&WATCHMEN	4,47	3,45	4,39	3,34	6,13	5,41	4,29	5,17
SHERIFFS,BAILIFFS,ETC.	1,51	3,33	4,41	1,32	5, 3	5,39	5,51	5,15
POLICEMEN&DETECTIVES	2, 1	3,44	4,40	1,33	5,35	5,42	5,50	5,14
CHILD CARE WK'S,P.H.	6,40	3,24	6,18	4, 9	2,15	2,13	1, 5	1, 3
COOKS,P.H.	6,49	3,29	6,47	1, 3	2, 6	2, 3	3,39	3,47
HOUSEKEEPERS,P.H.	6,48	3,27	6,45	1, 5	2, 7	2, 5	3,37	3,45
MAIDS&SERVANTS,P.H.	6,47	3,28	6,46	1, 4	2, 8	2, 4	3,38	3,46

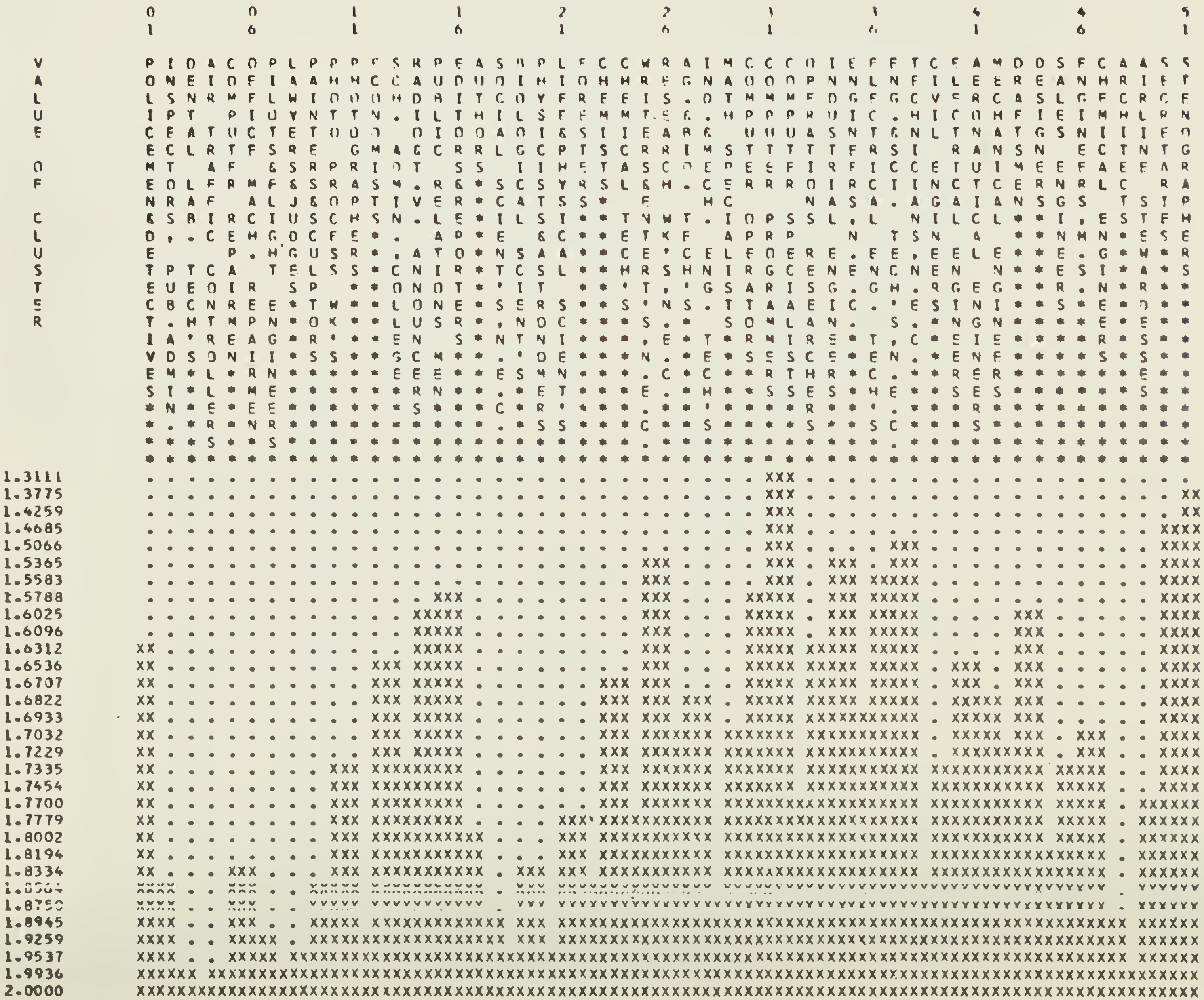
APPENDIX D

CLUSTER CONFIGURATIONS

Appendix D

Cluster Configurations

C. C. I.1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1.5788
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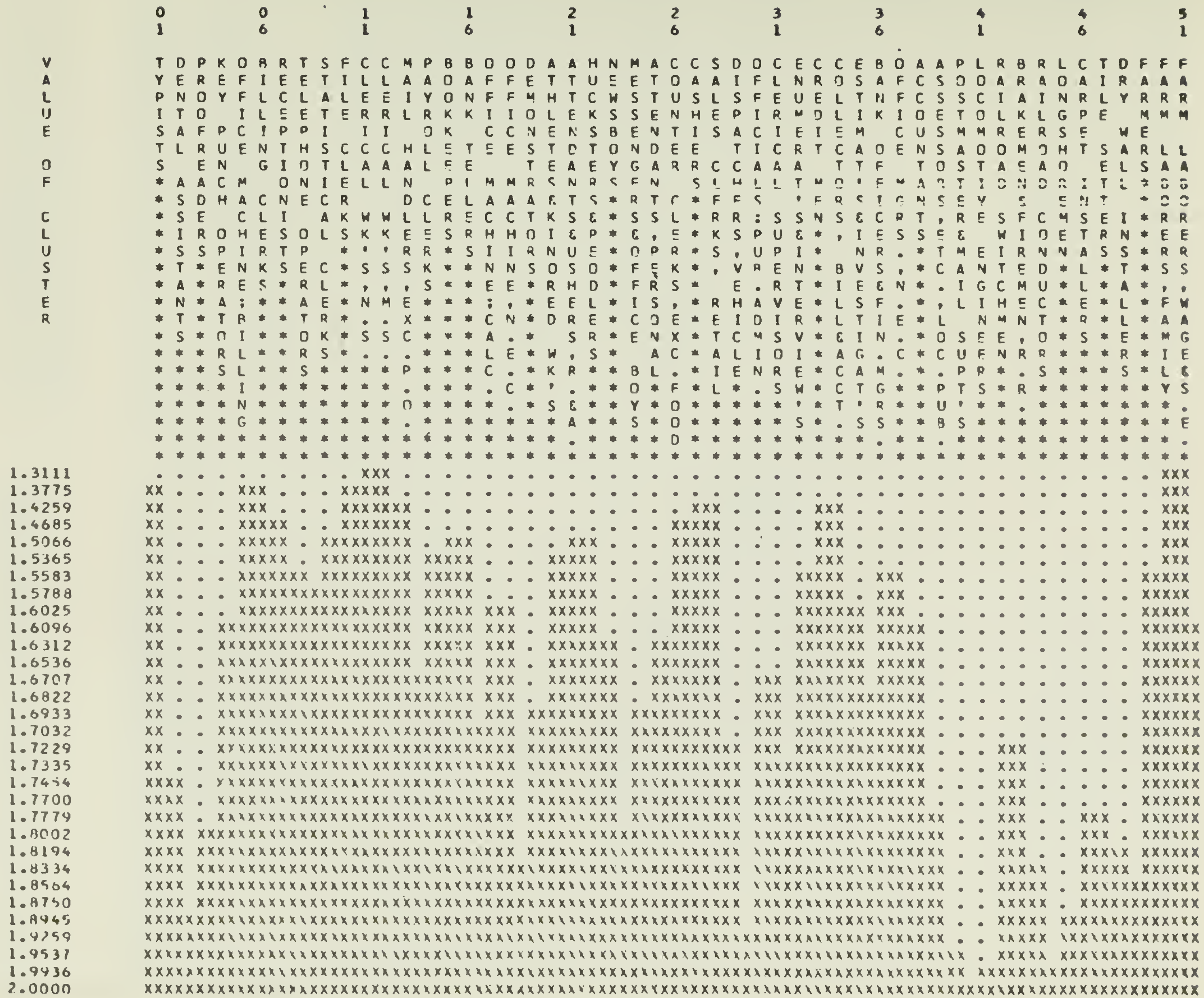
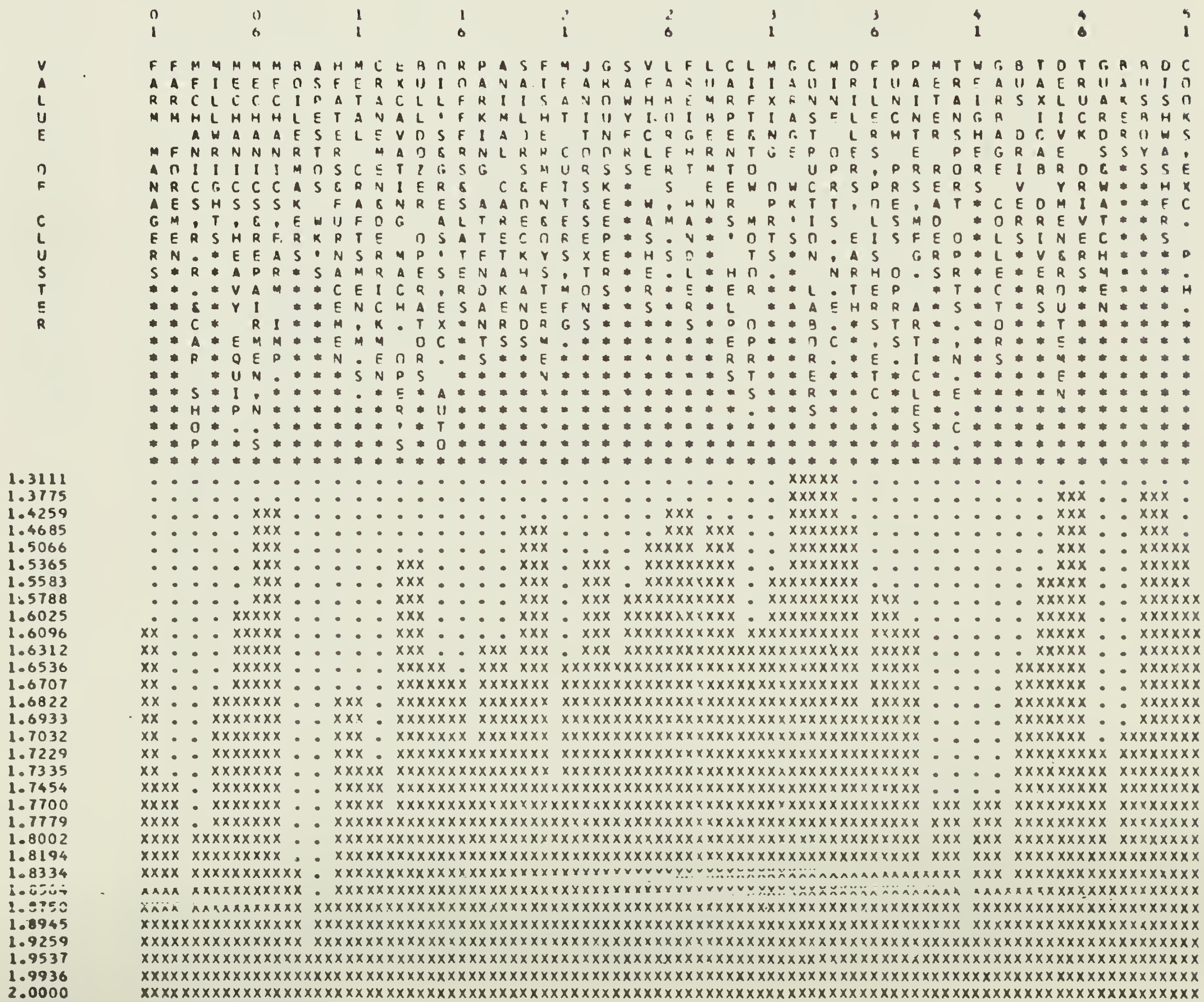
1.6096
1.6312
1.6536
1.6707
1.6822
1.6933
1.7032
1.7229
1.7335
1.7454
1.7700
1.7779
1.8002
1.8194
1.8334
1.8750
1.8945
1.9259
1.9537
1.9936
2.0000

Appendix D (continued)

C. C. I.3

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1.6312
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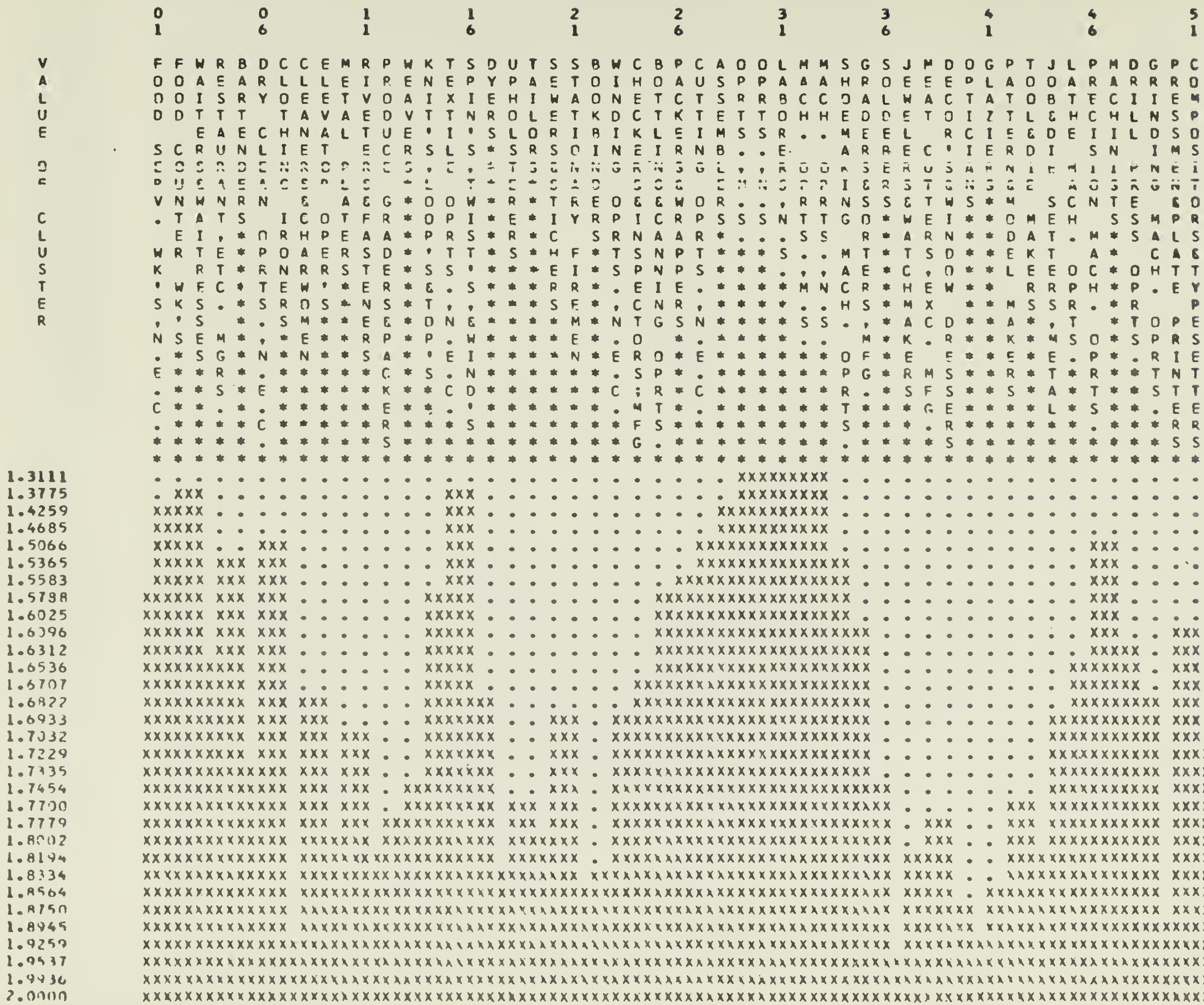
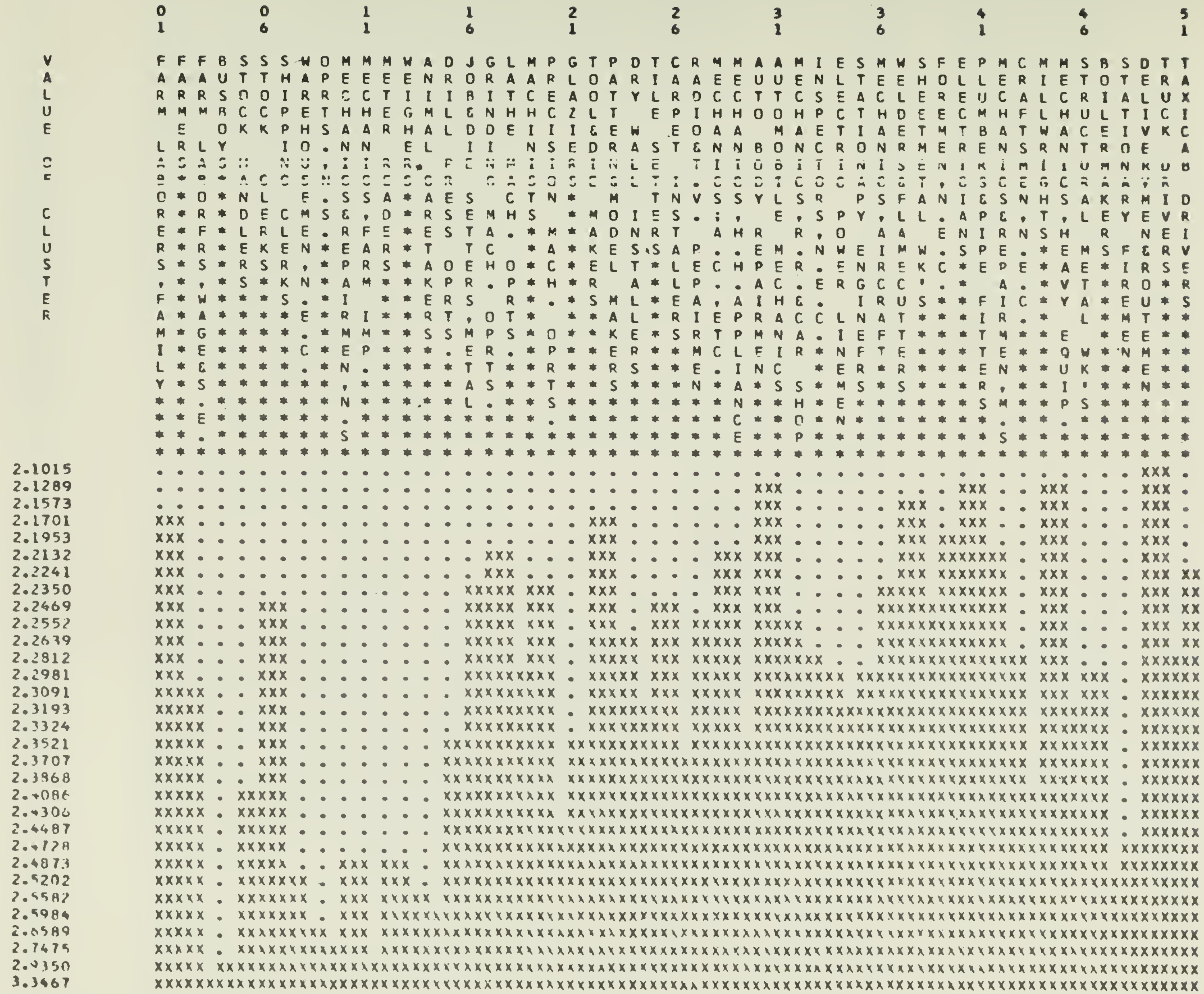


Appendix D (continued) C. C. I.6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2.2639
2.2812
2.2981
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2.3193
2.3324
2.3521
2.3707
2.3868
2.4086
2.4306
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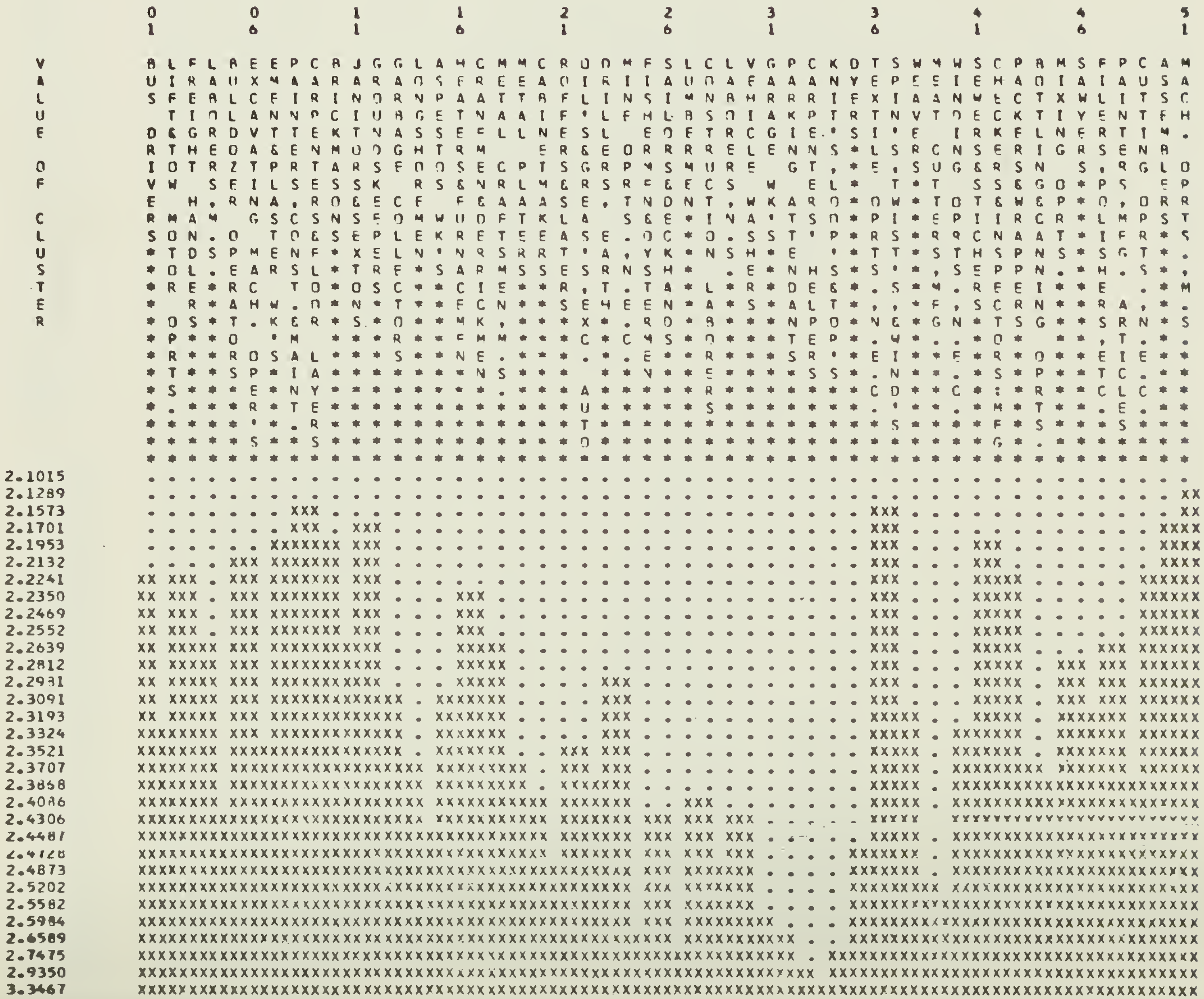
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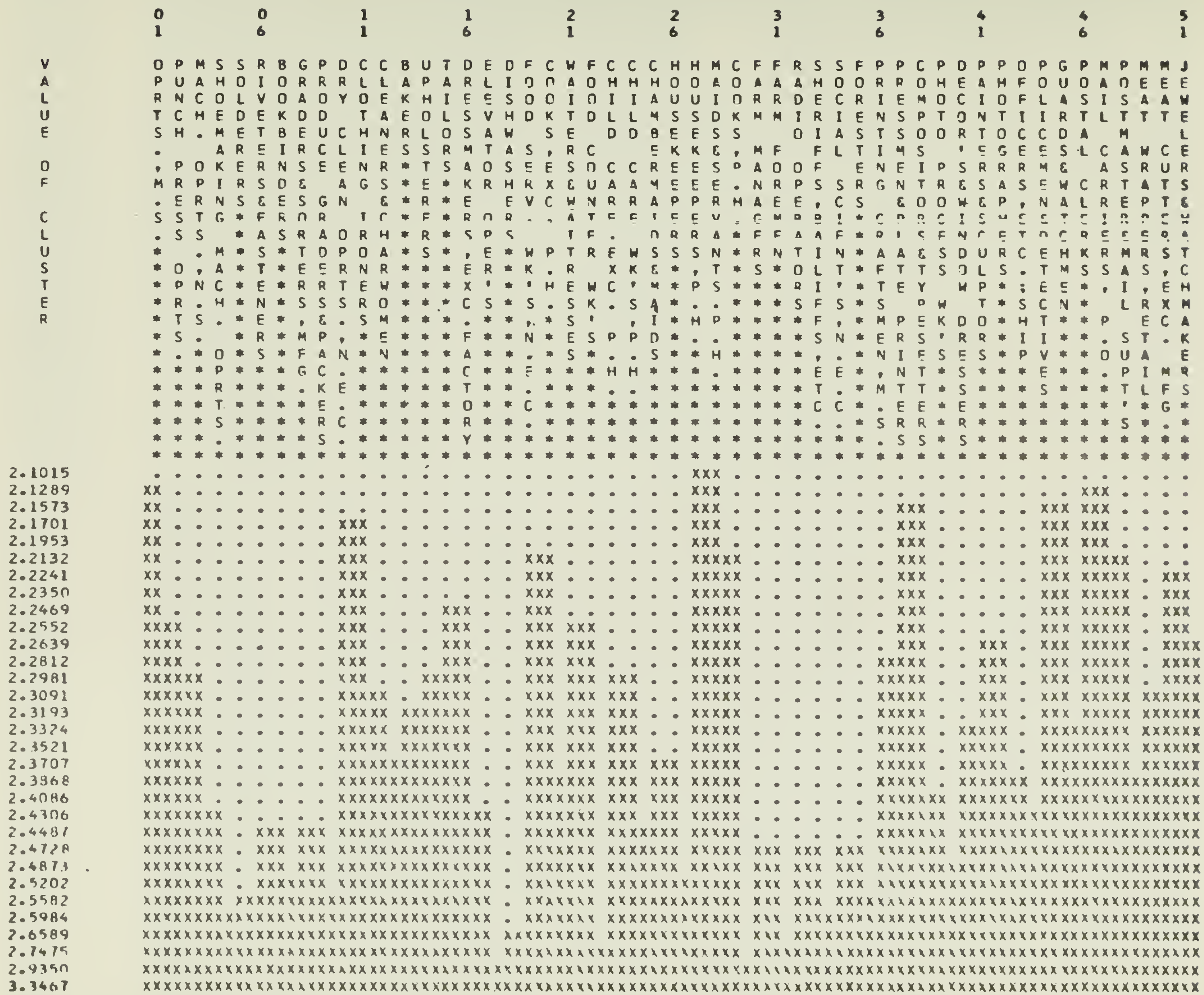

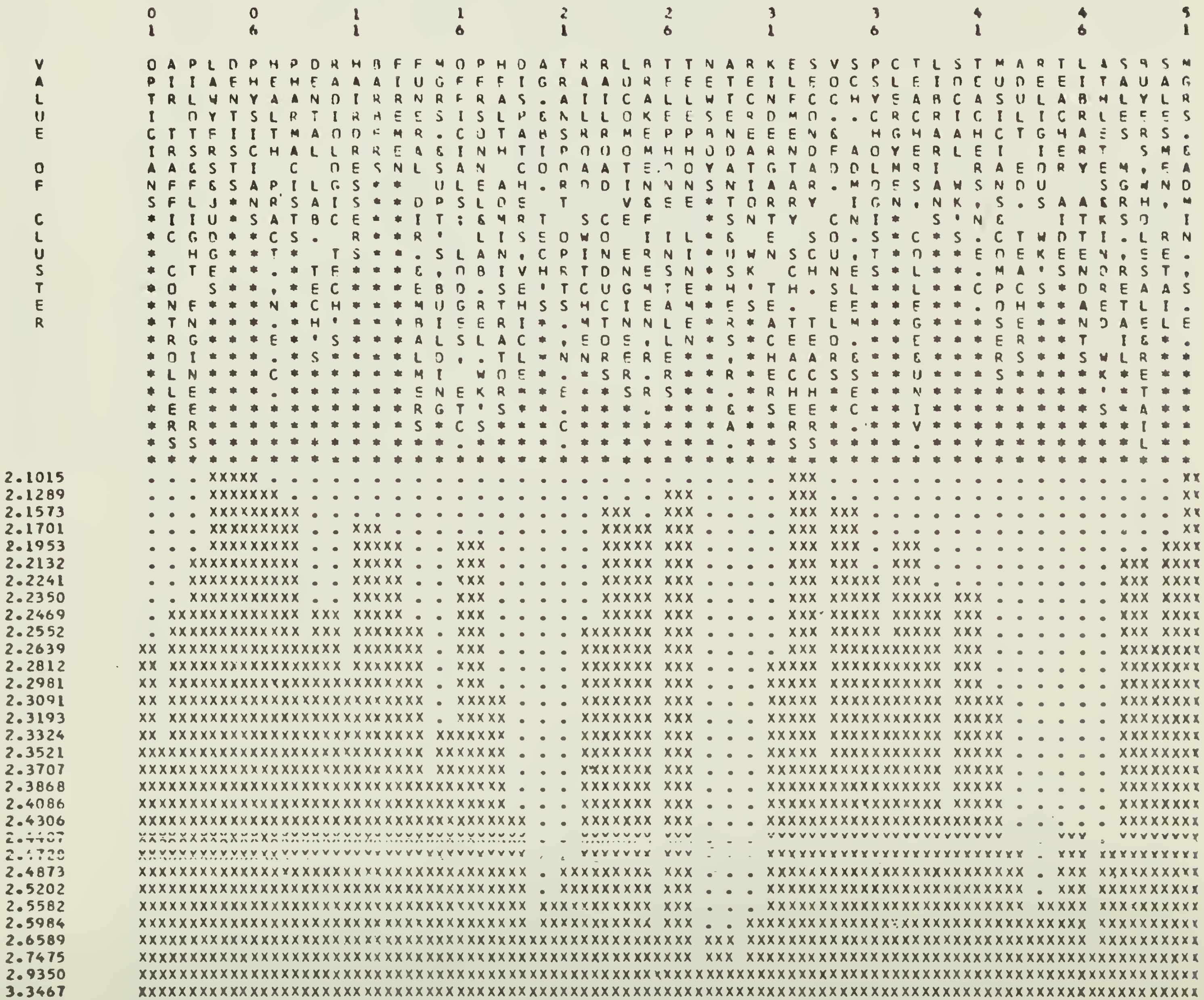
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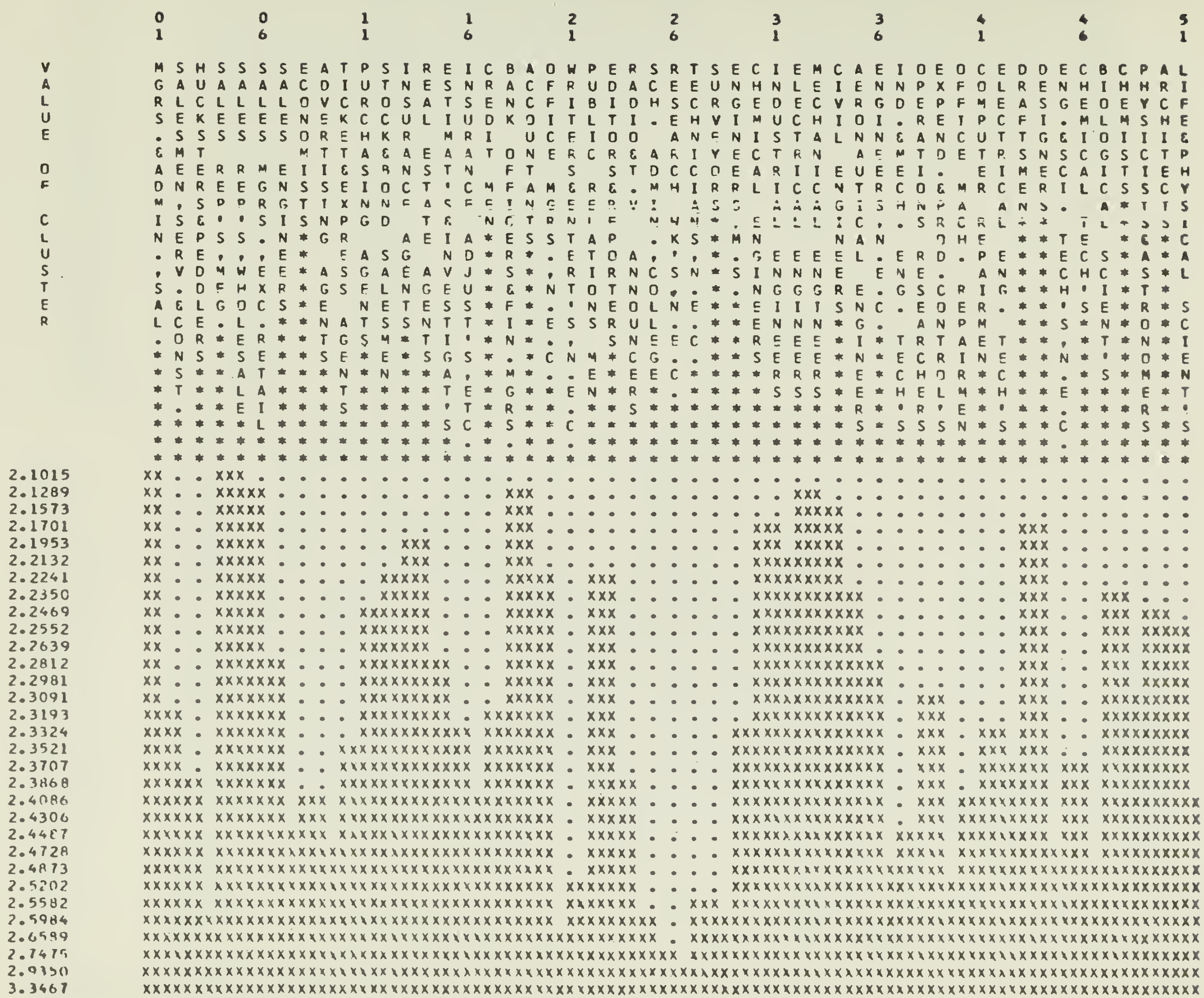
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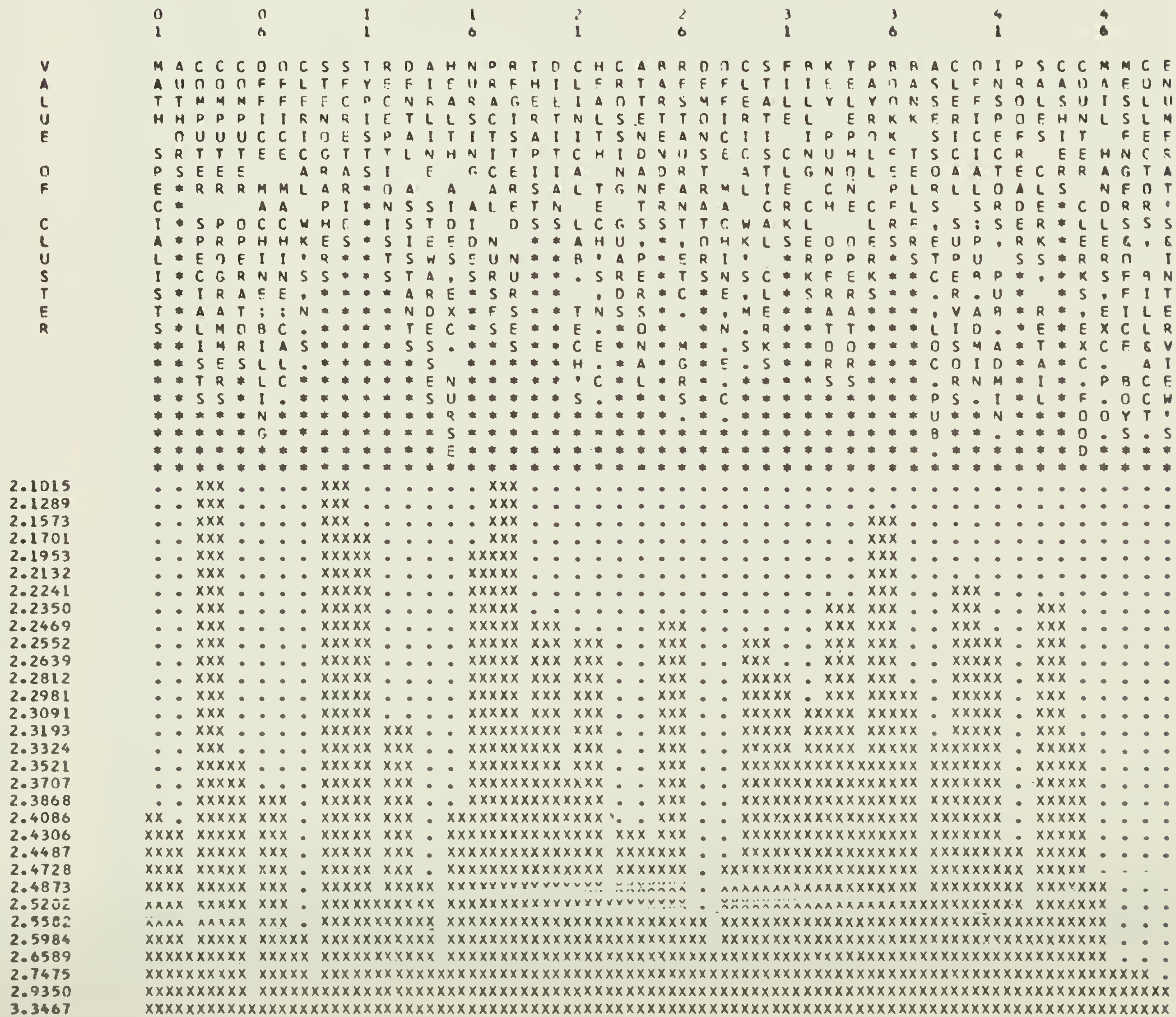
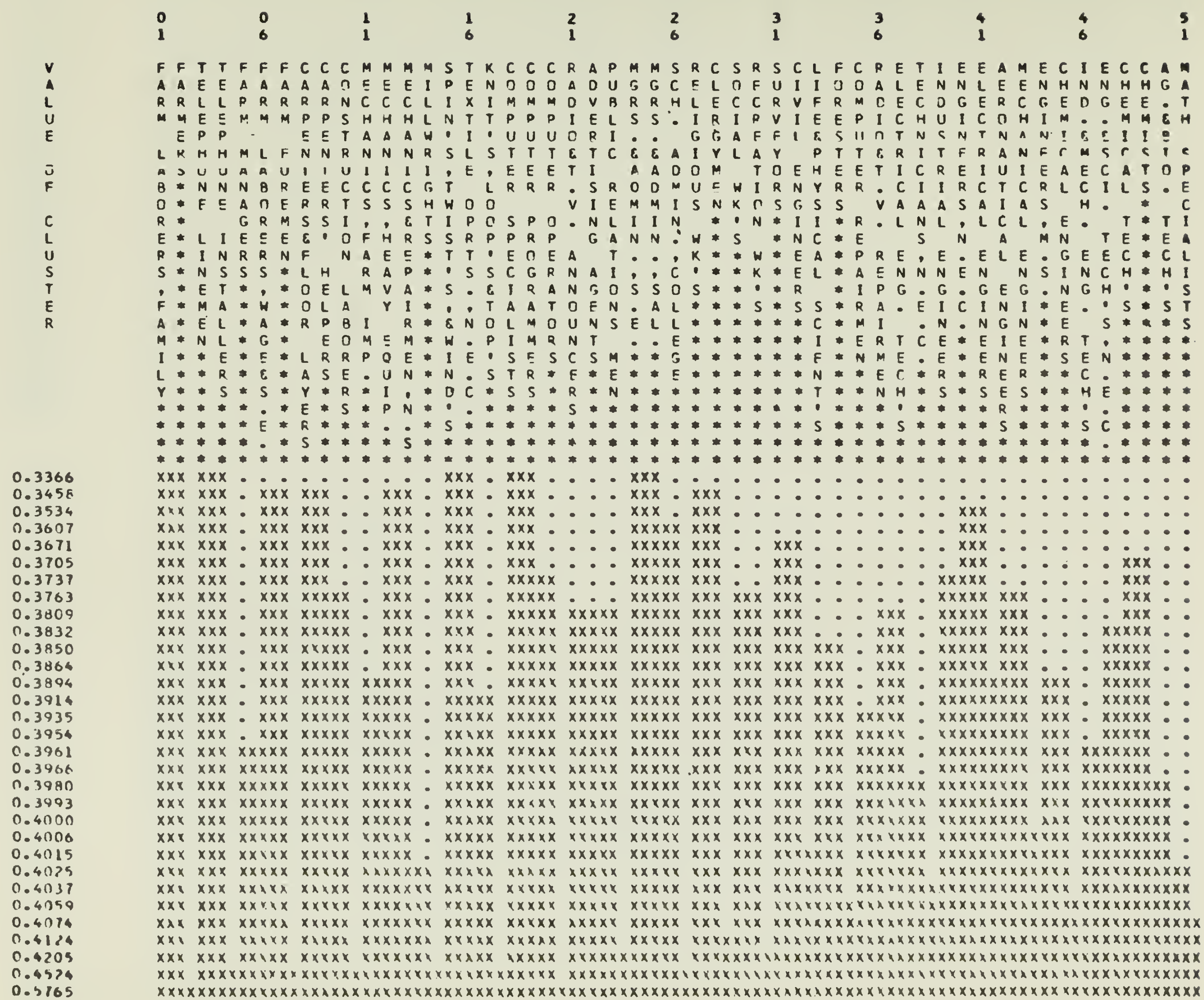
2.9350
3.3467

Appendix D (continued)

C. C. II.6

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0.3832
0.3850
0.3864
0.3894
0.3914
0.3935
0.3954
0.3961
0.3966
0.3980
0.3993
0.4000
0.4006
0.4015
0.4025
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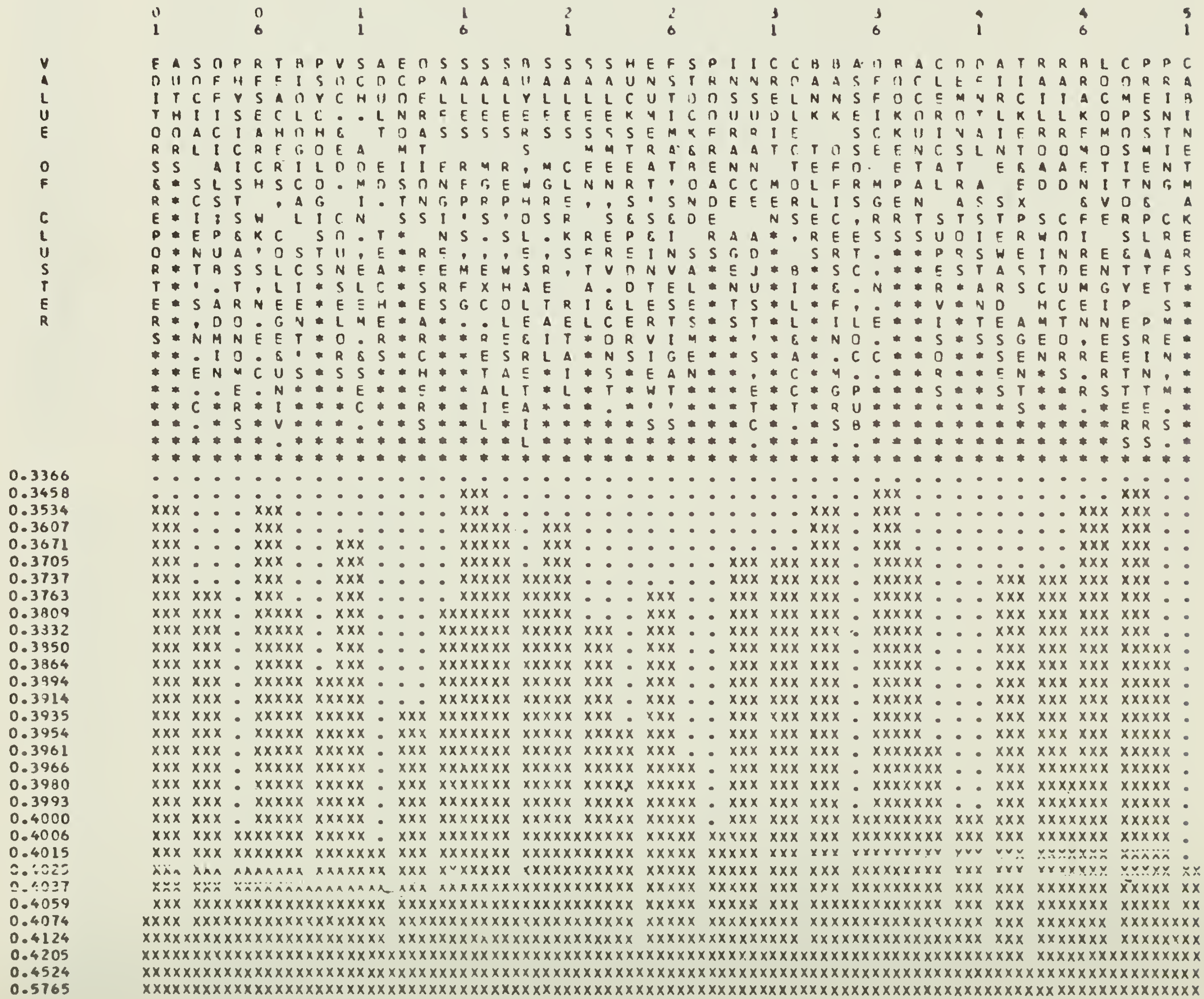
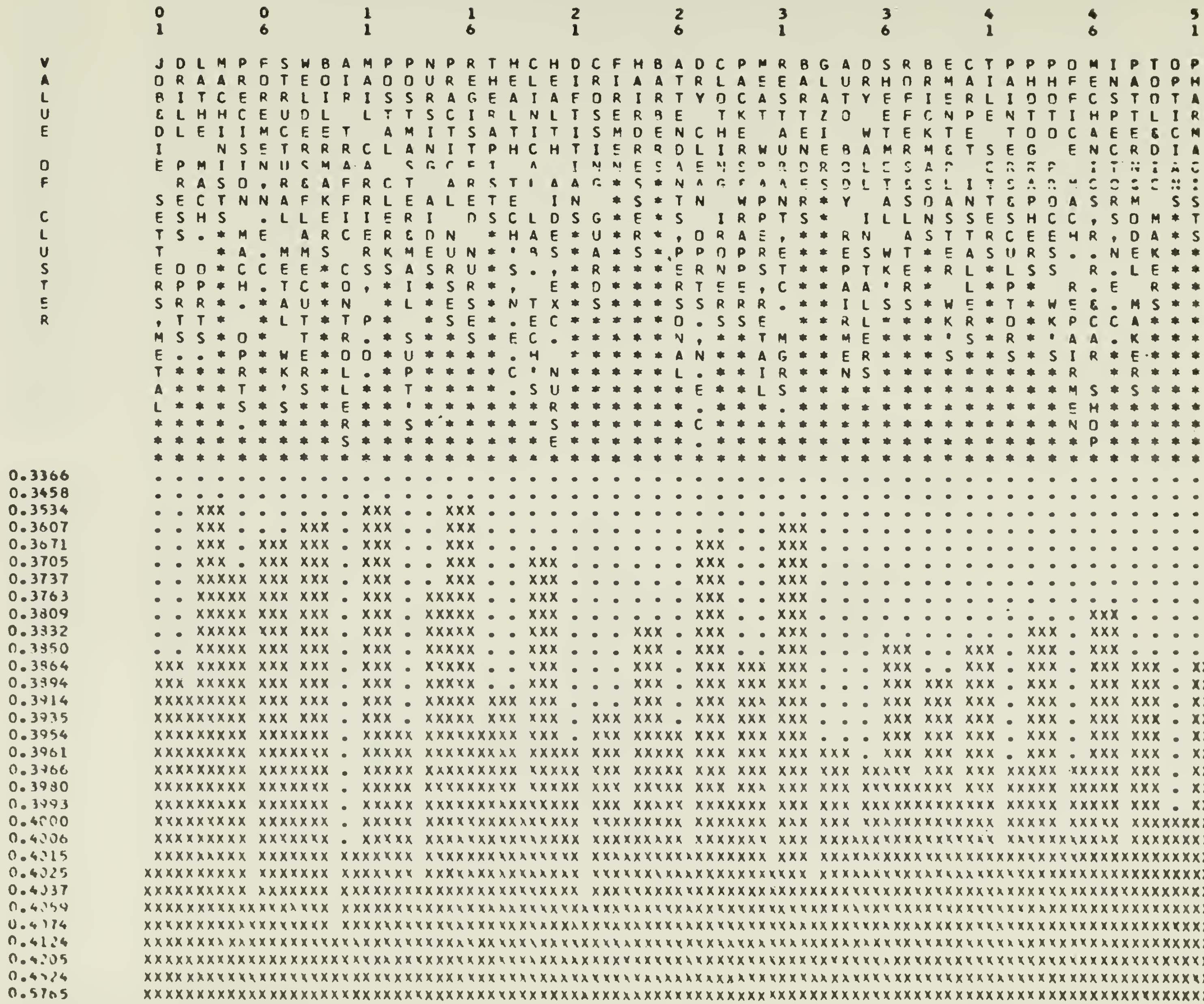
0.4074
0.4124
0.4205
0.4524
0.5765

Appendix D (continued)

C. C. III.2

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0.3332
0.3350
0.3864
0.3394
0.3914
0.3935
0.3954
0.3961
0.3966
0.3980
0.3993
0.4000
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0.4074
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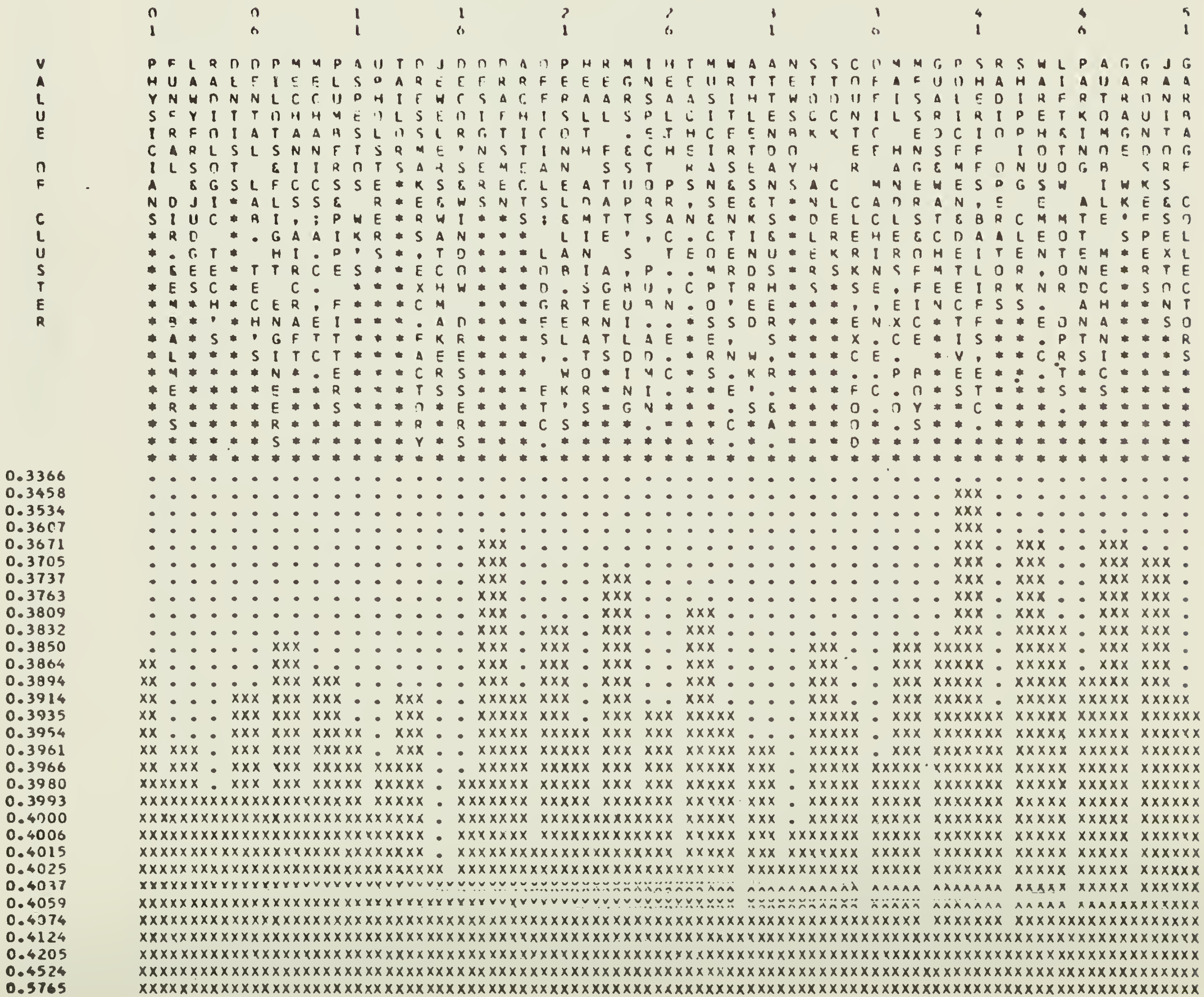
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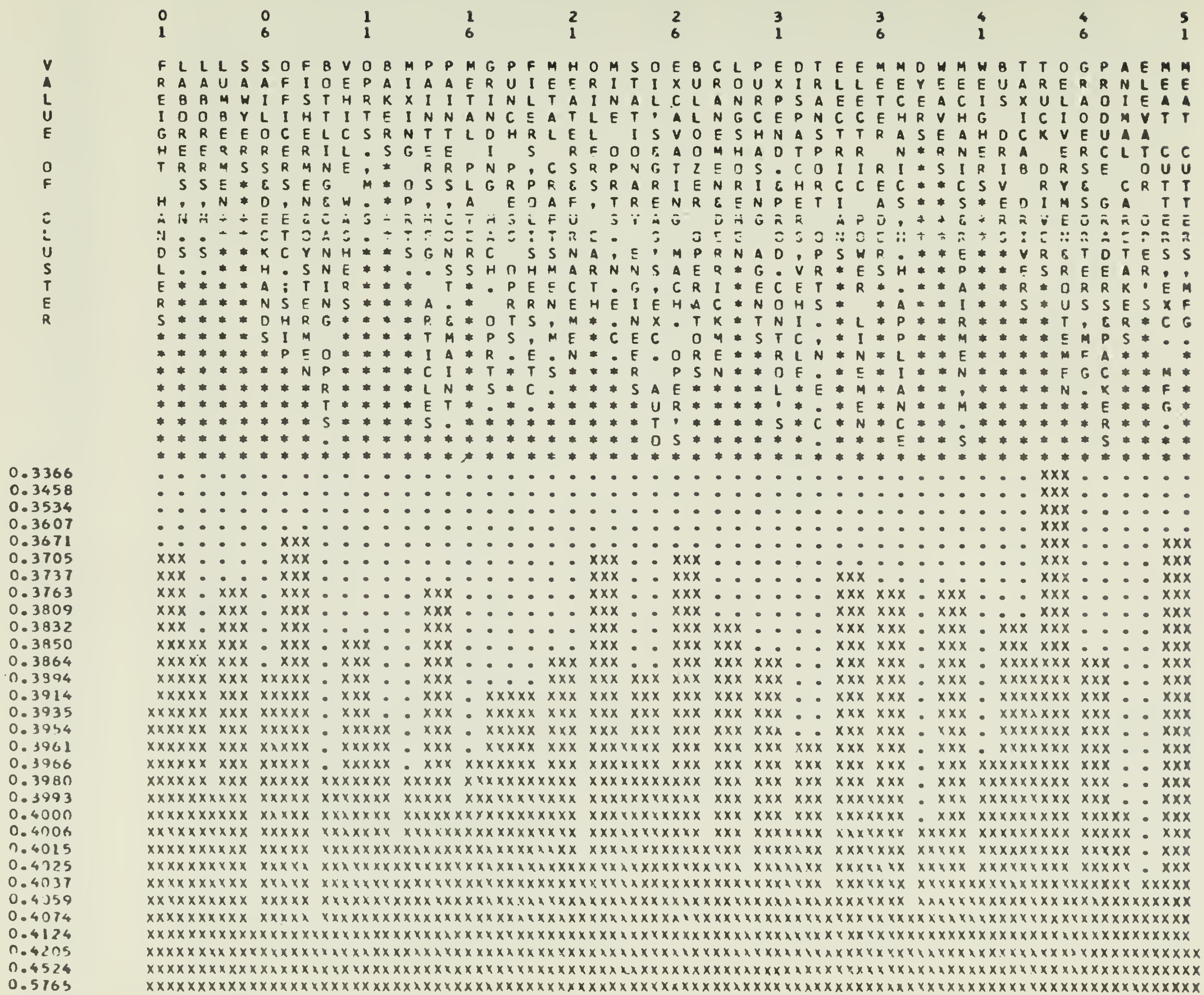

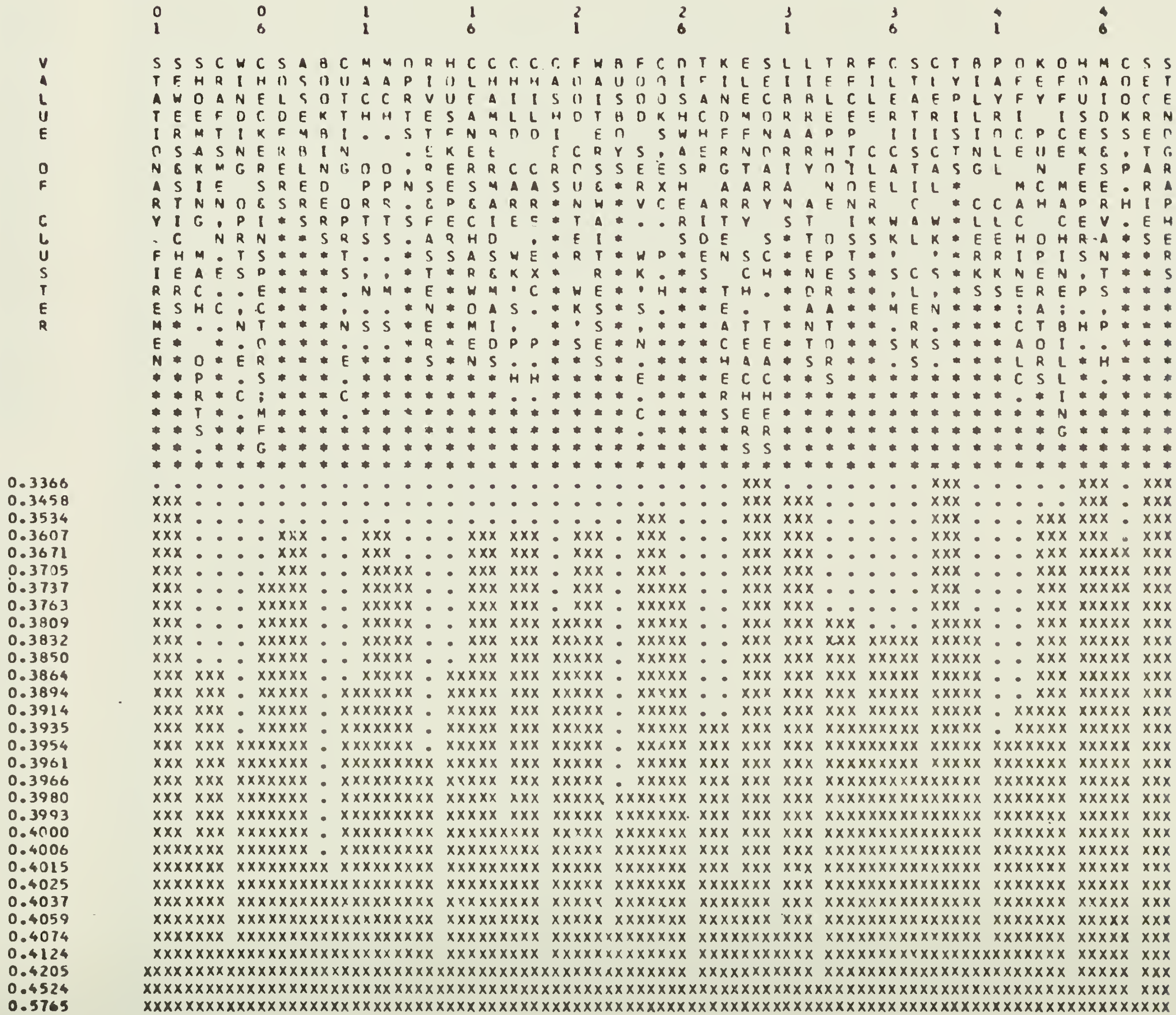
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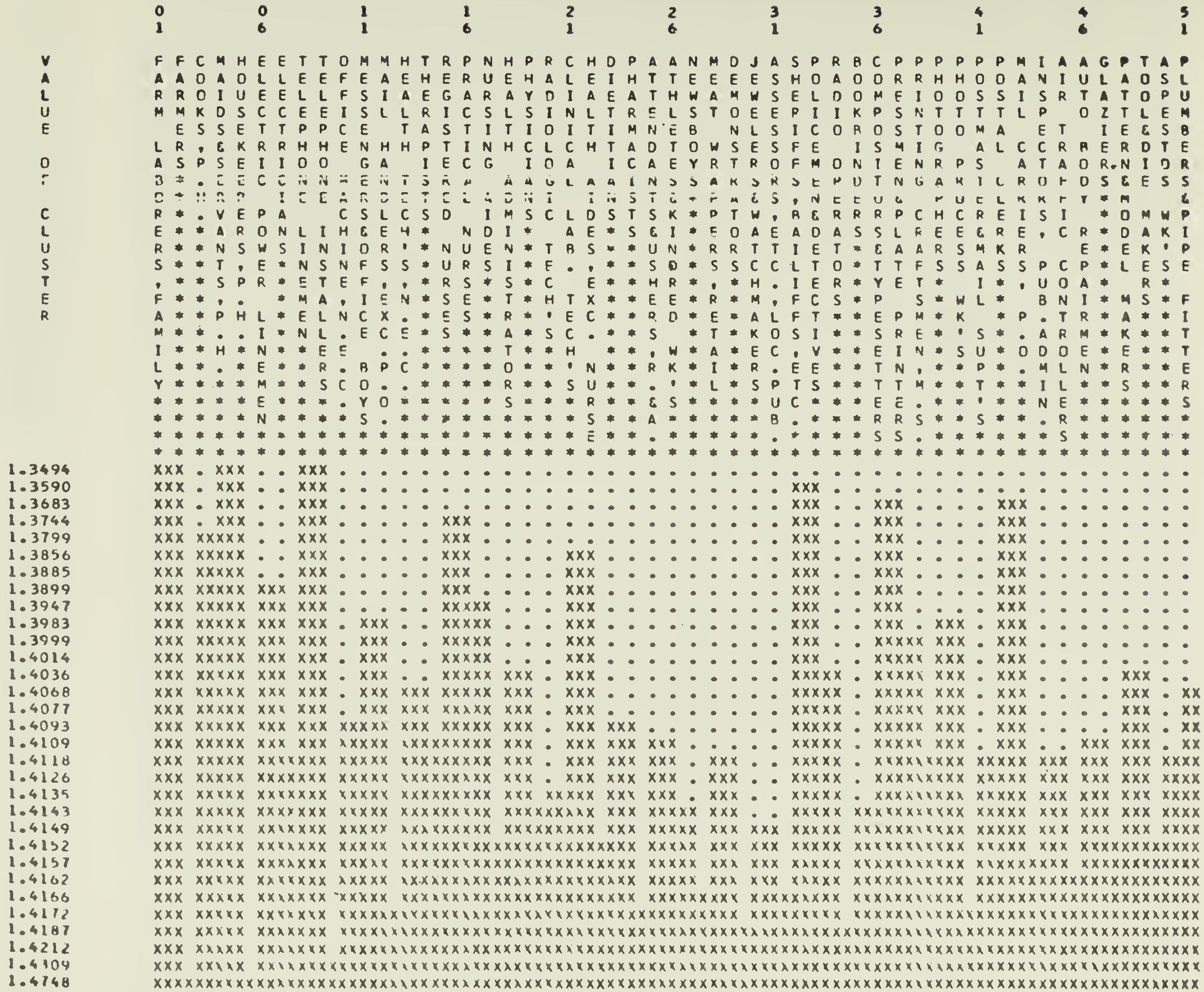
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1.4014
1.4036
1.4068
1.4077
1.4093
1.4109
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1.4143
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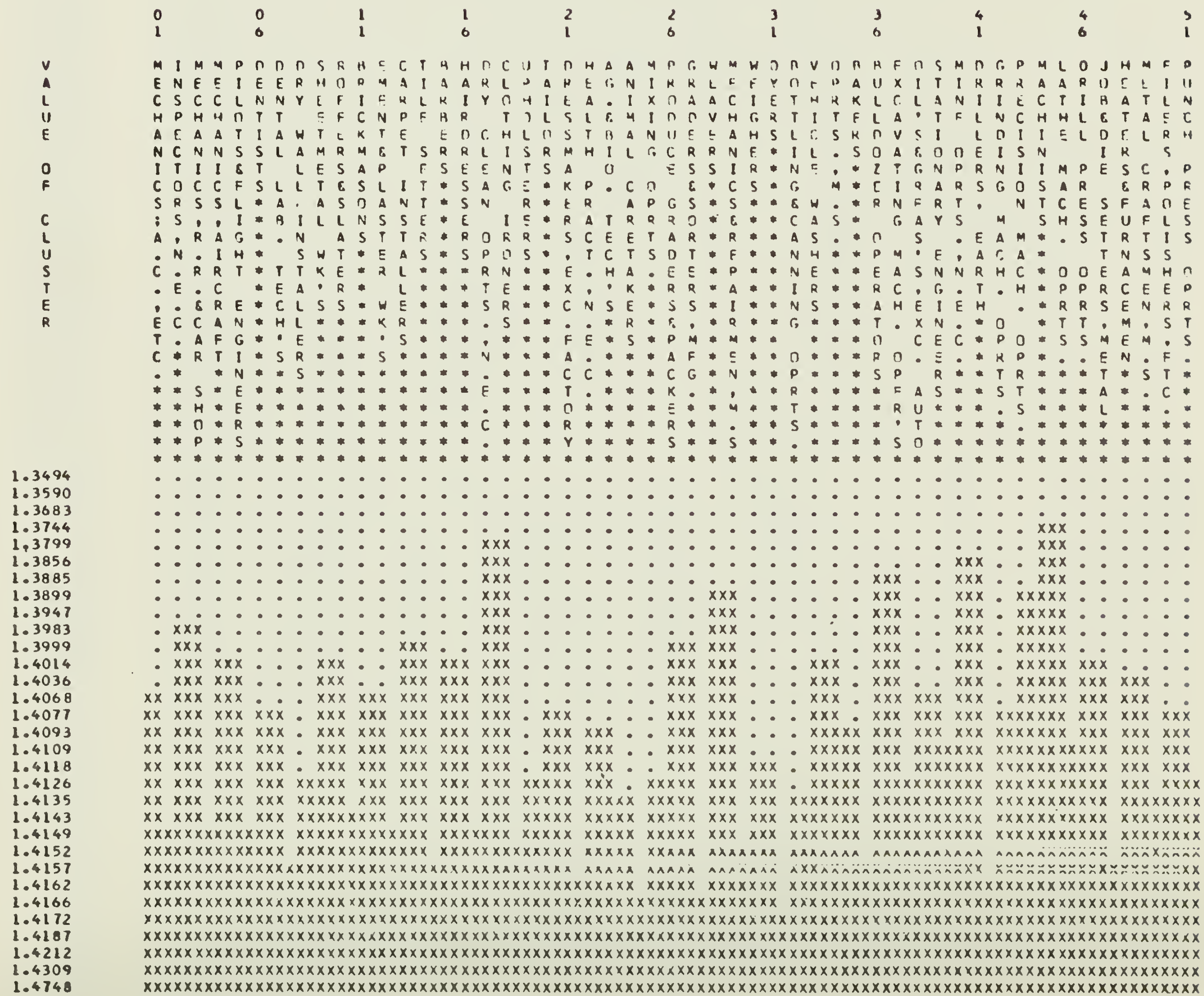
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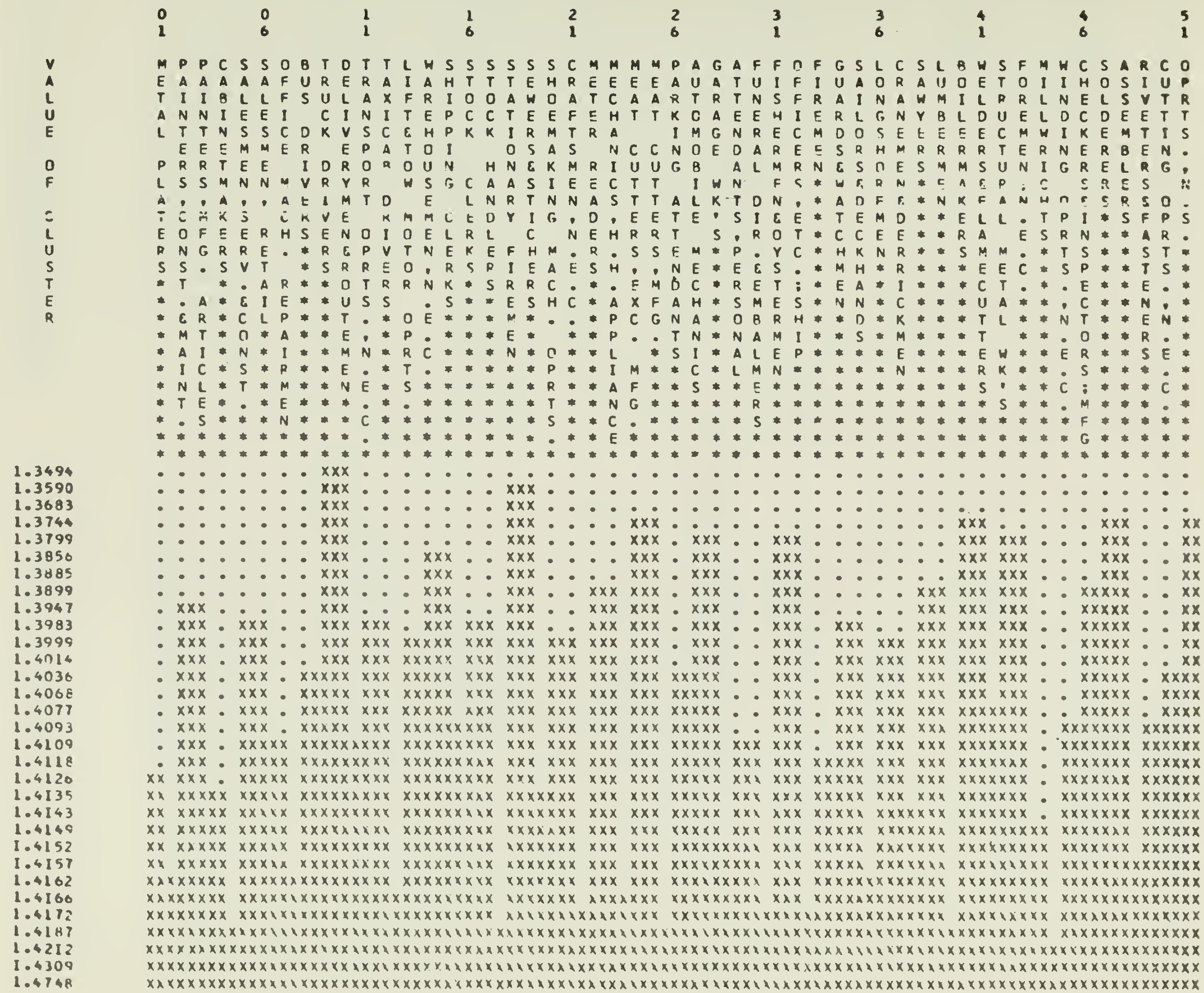
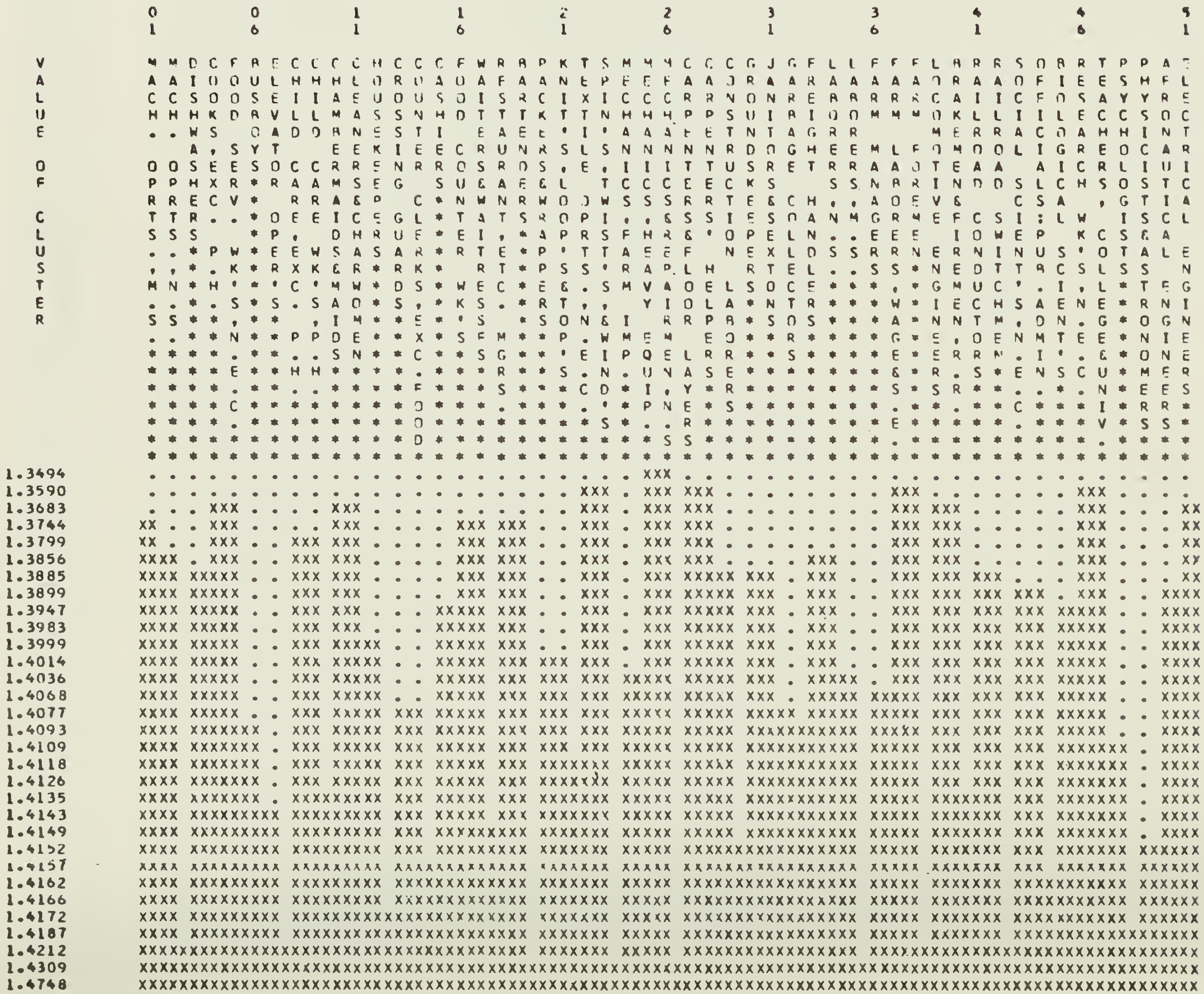
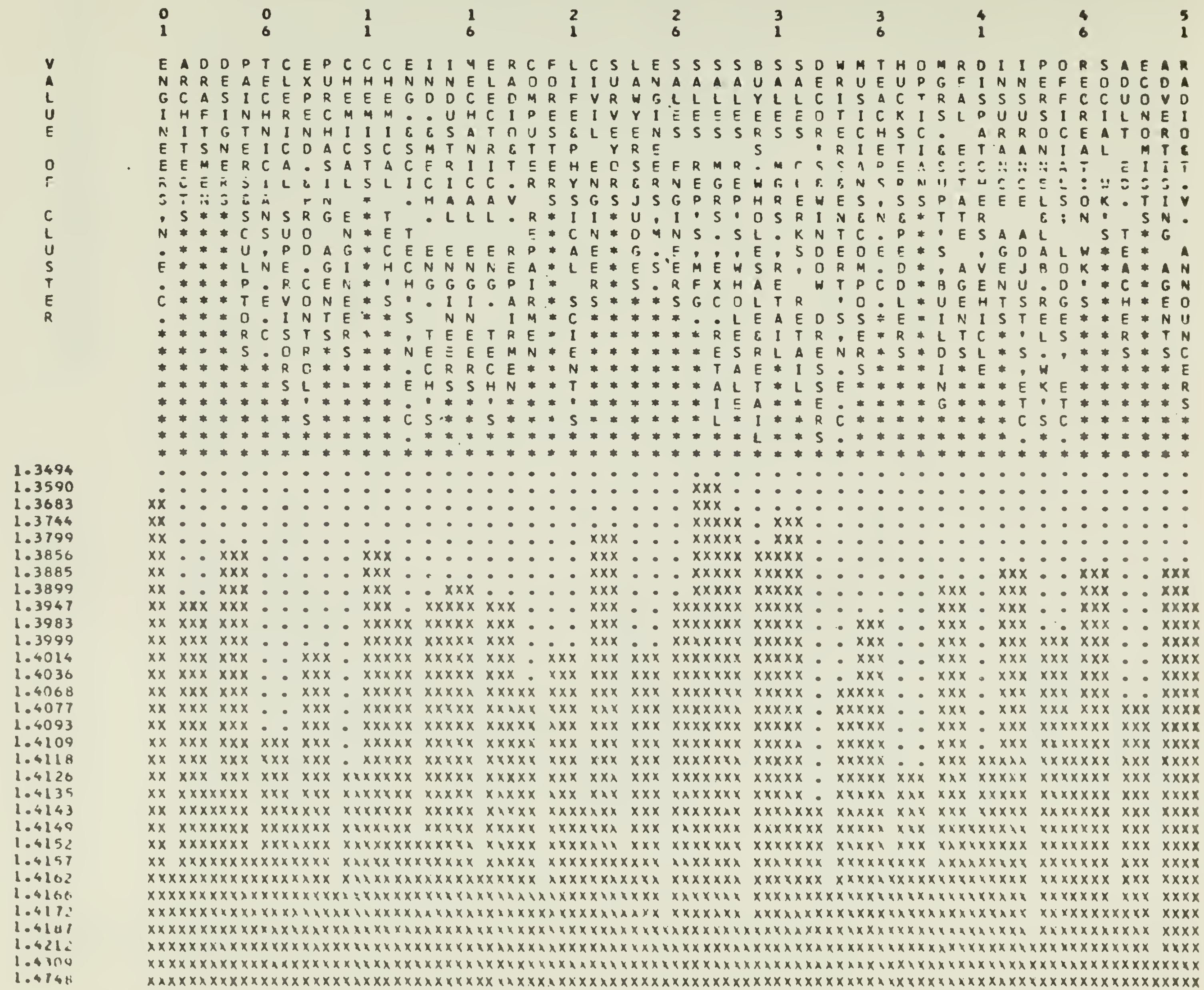
Appendix D (continued) C. C. IV.3



Appendix D (continued)

C. C. IV.4

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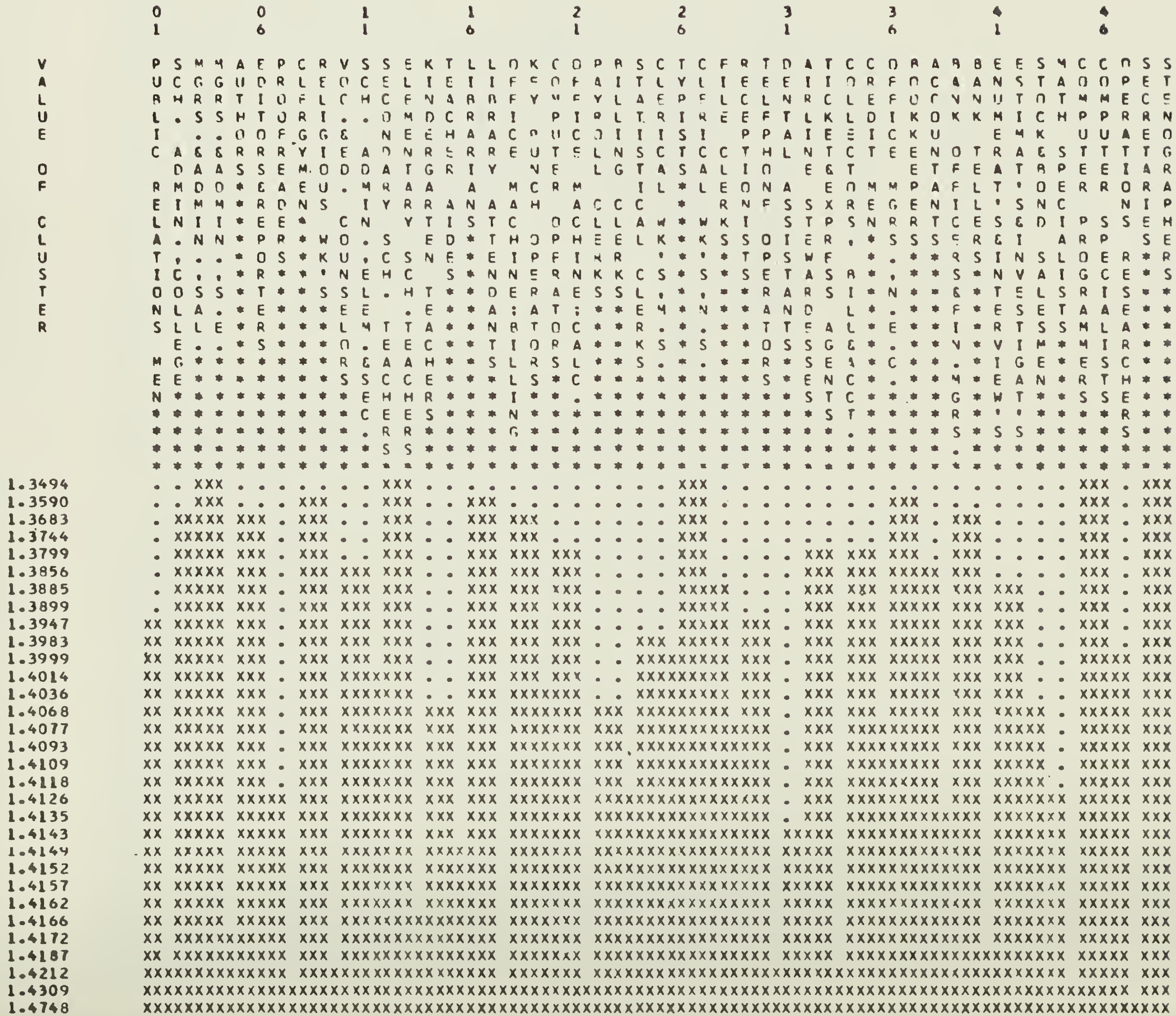
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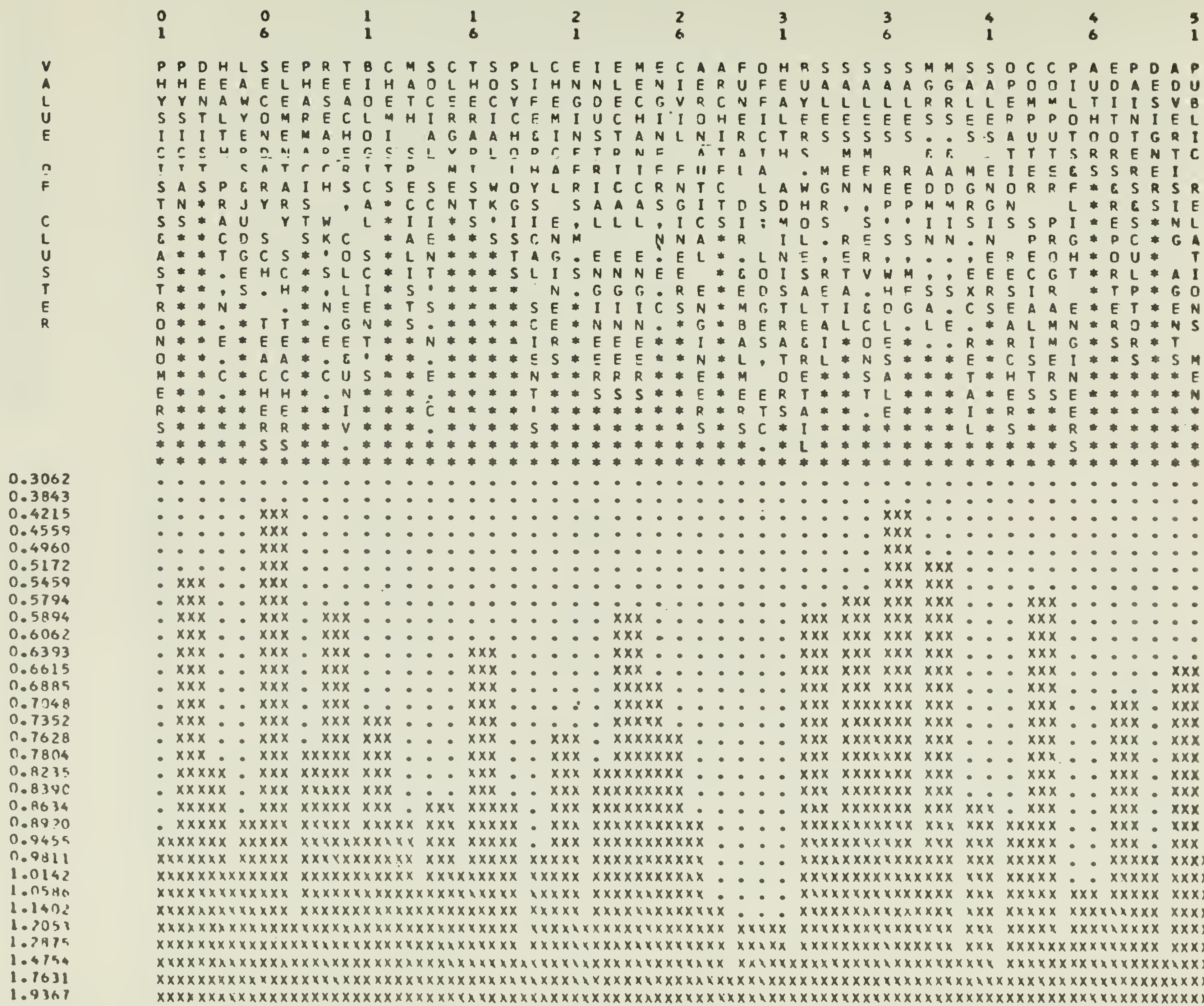
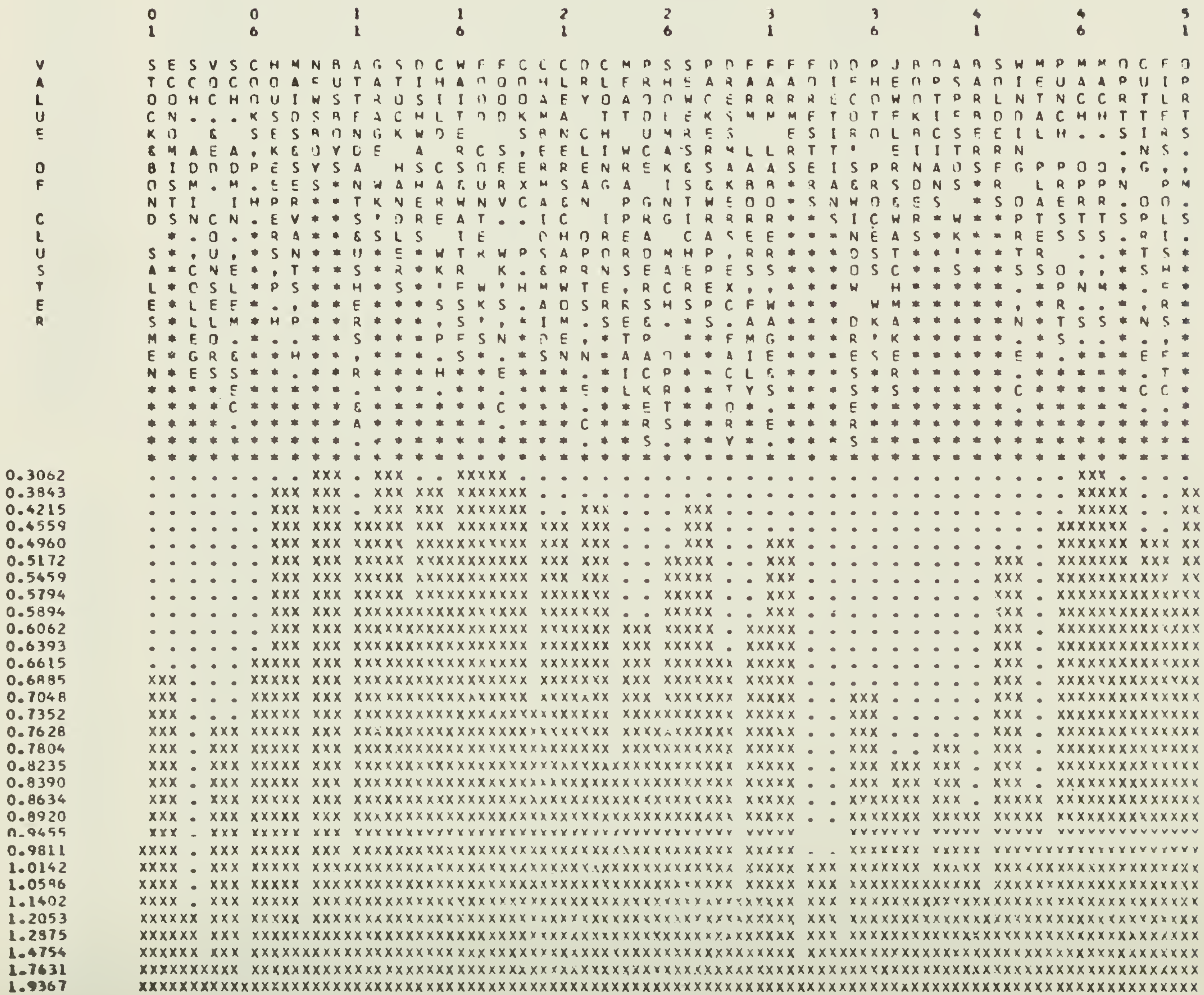
Appendix D (continued)

C. C. V.1

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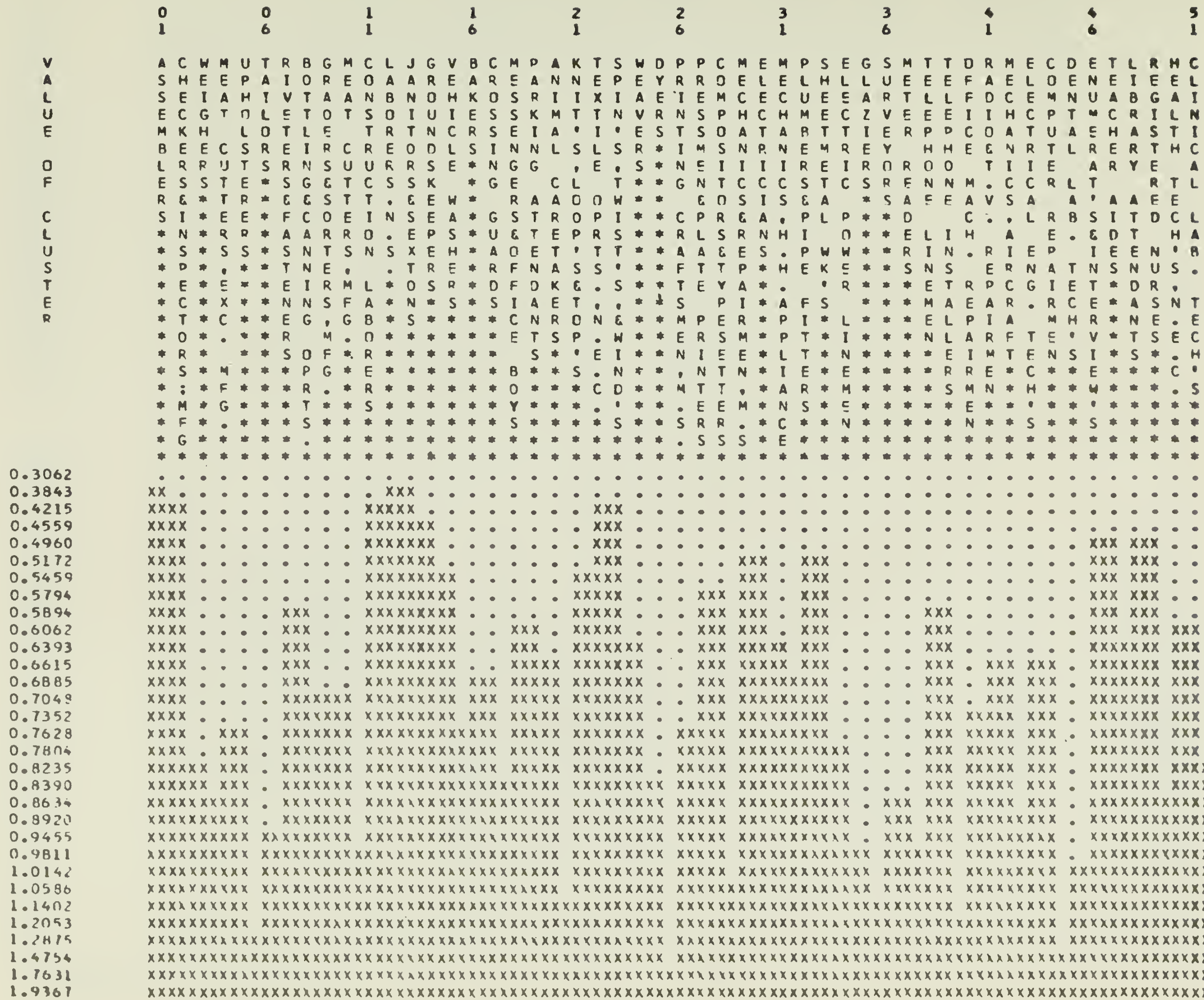
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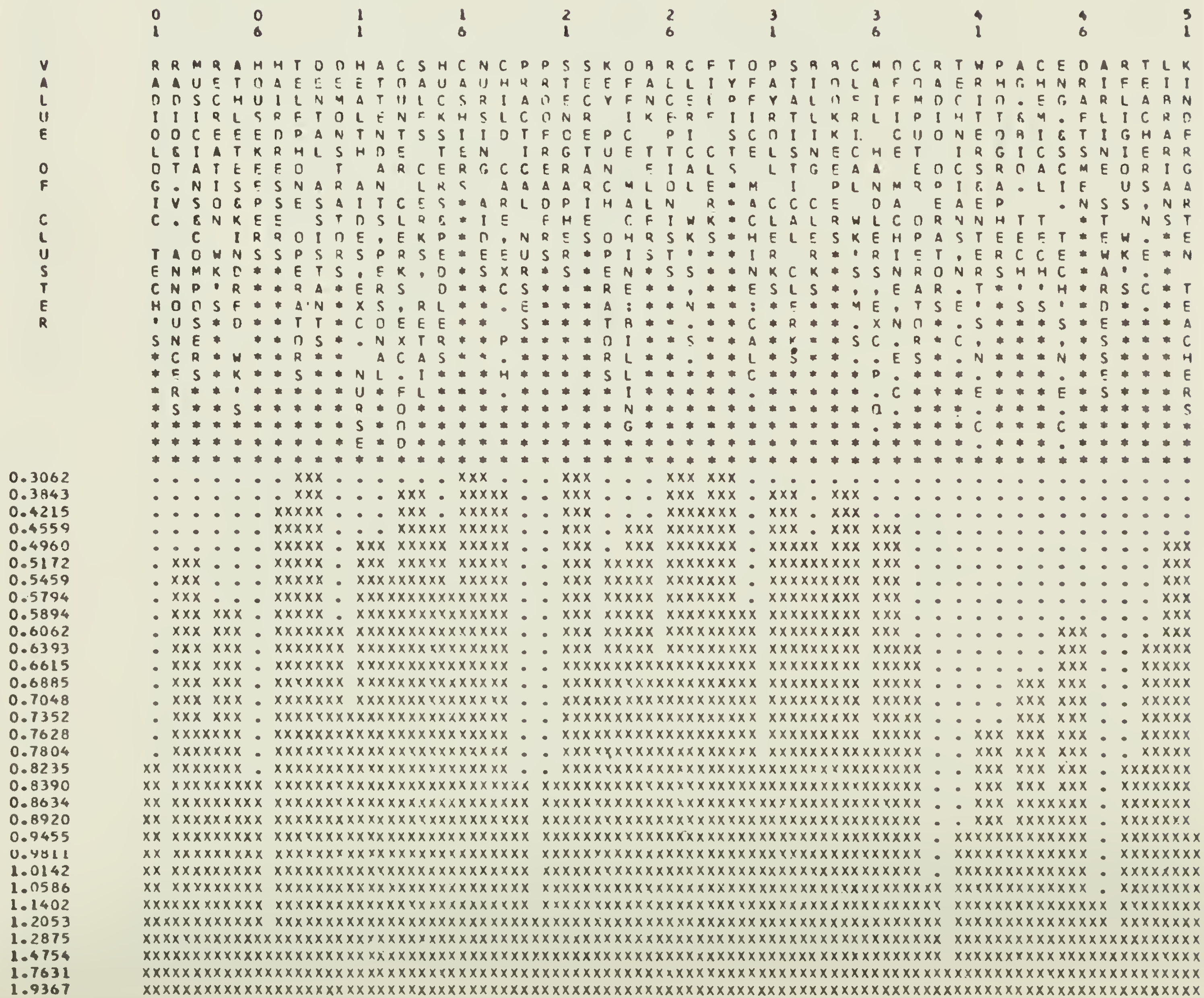

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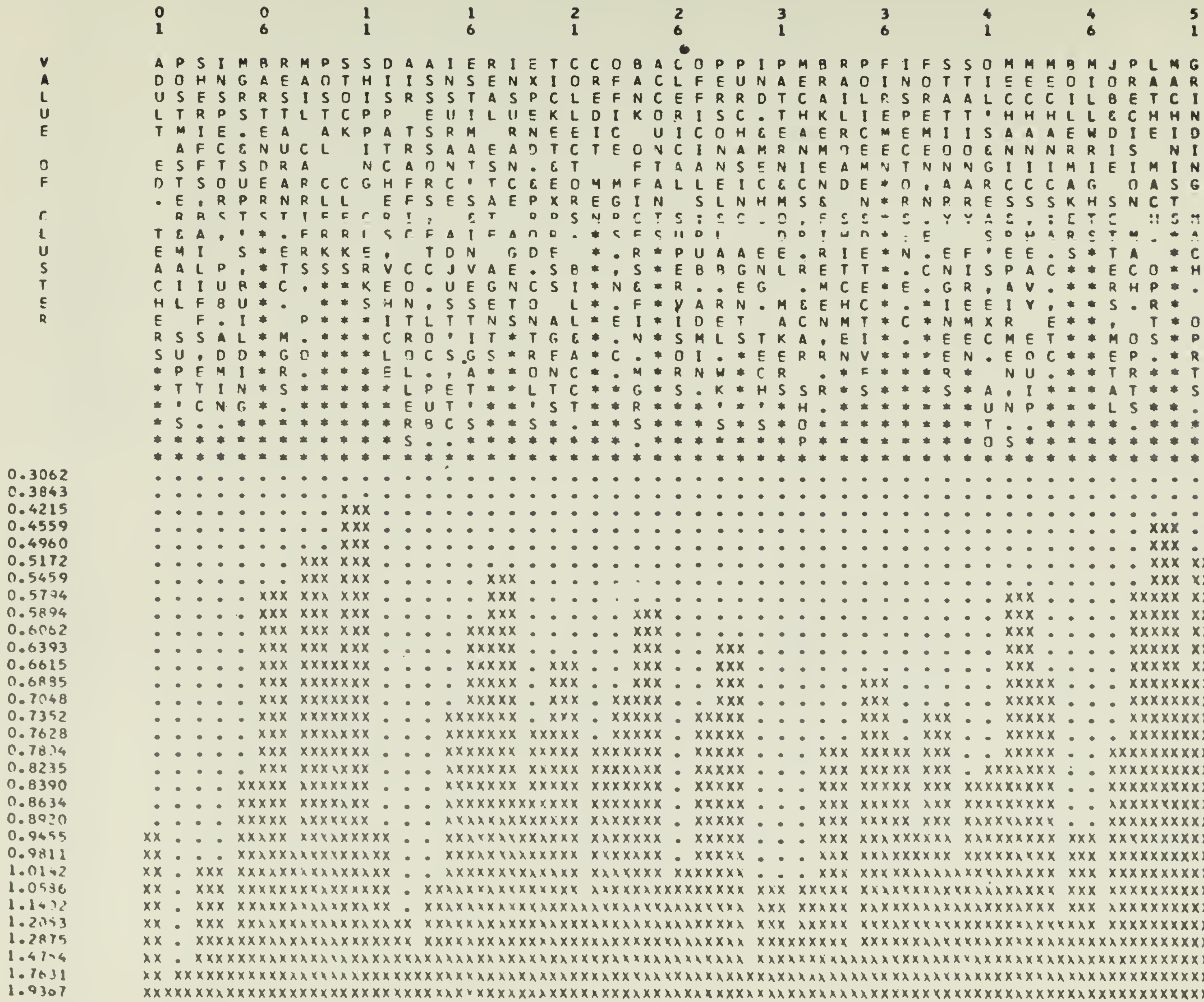

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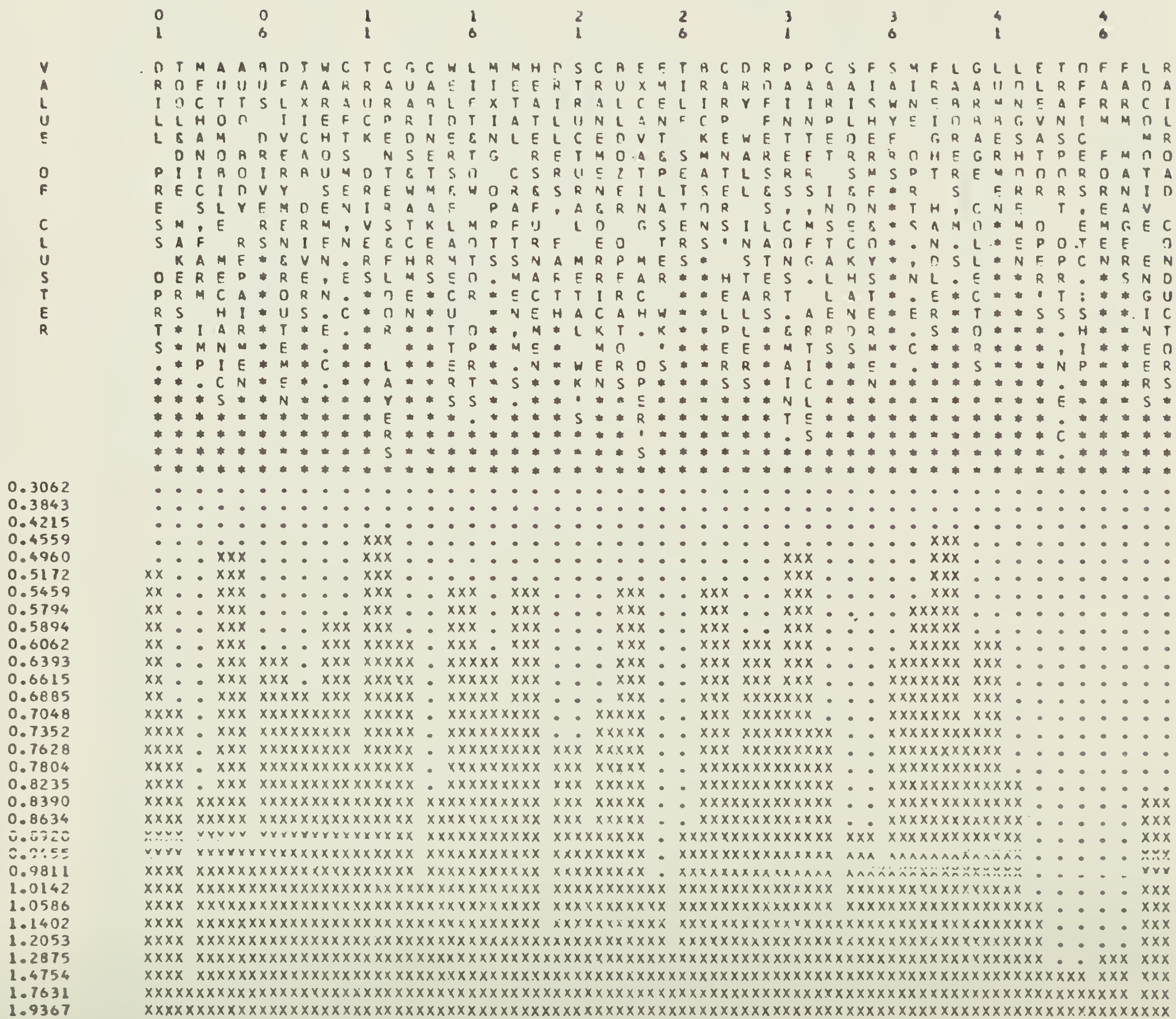

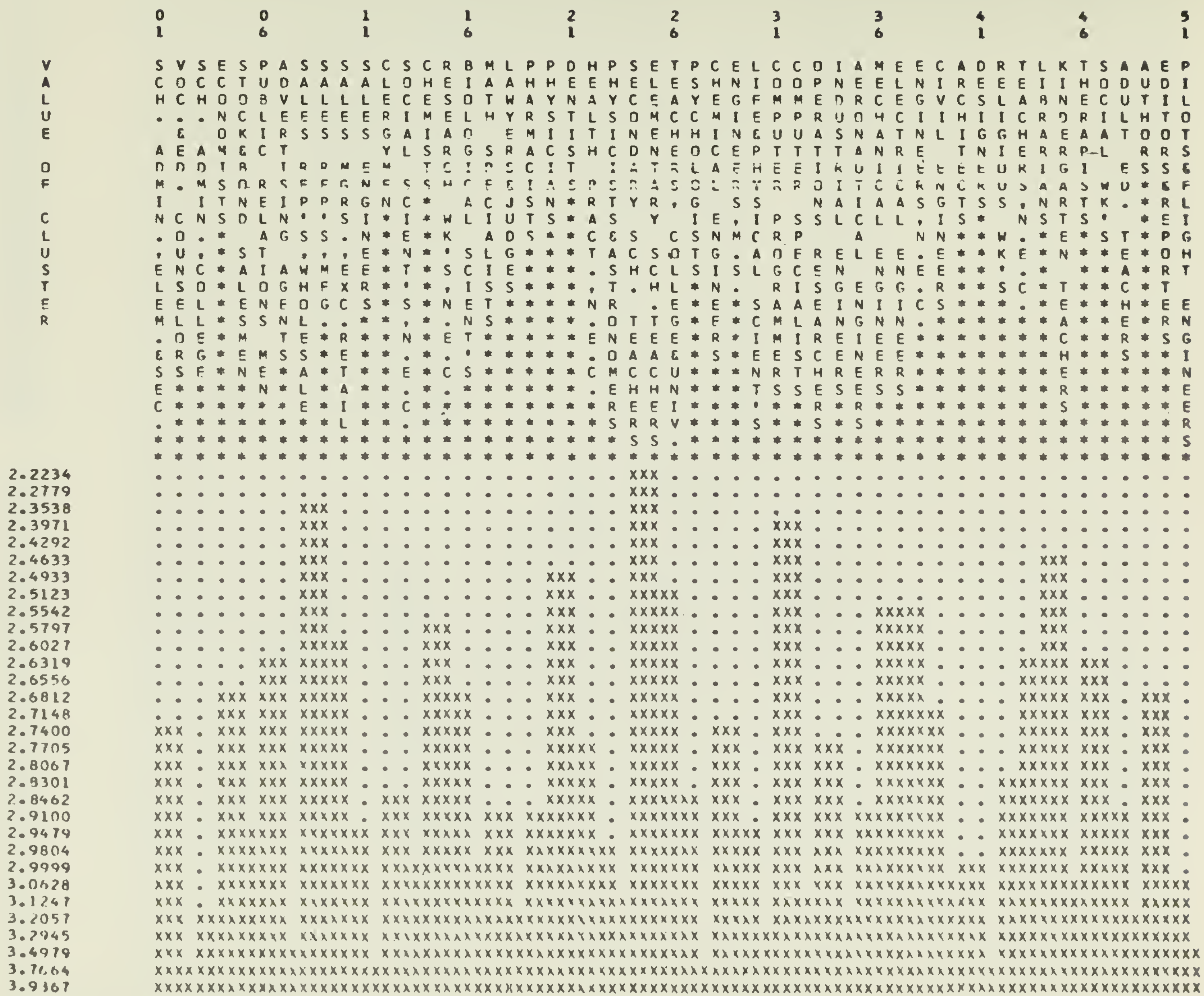
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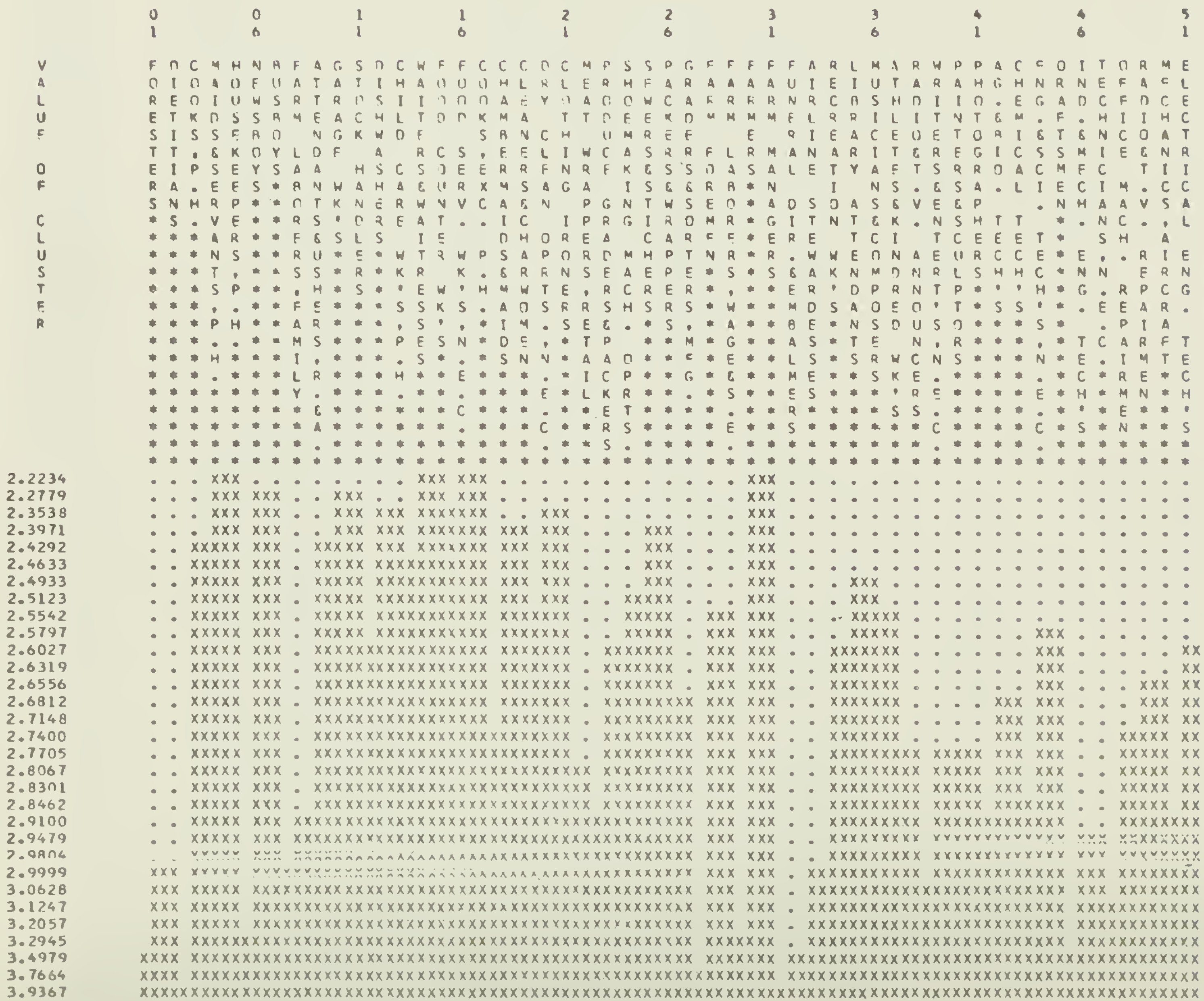

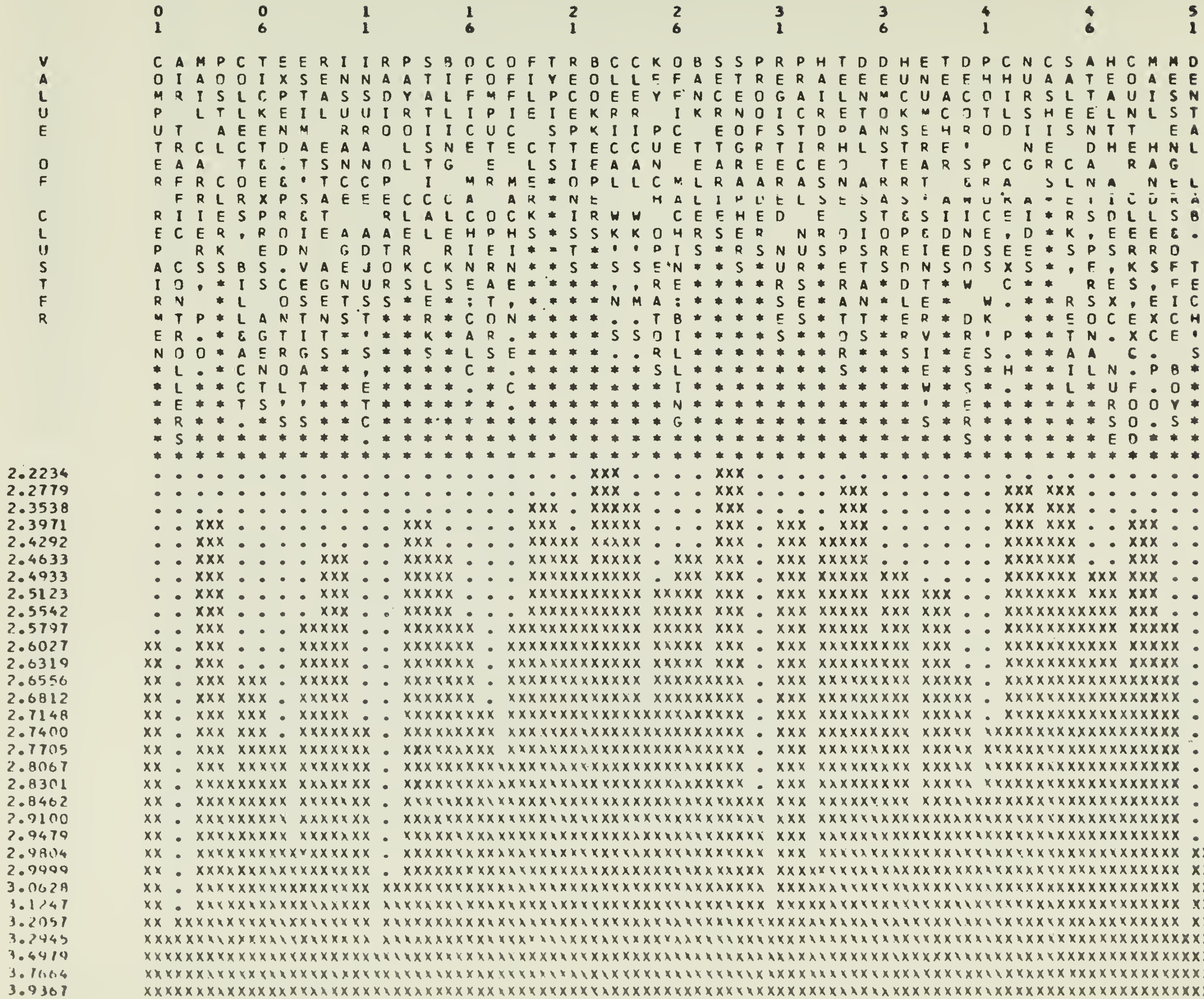
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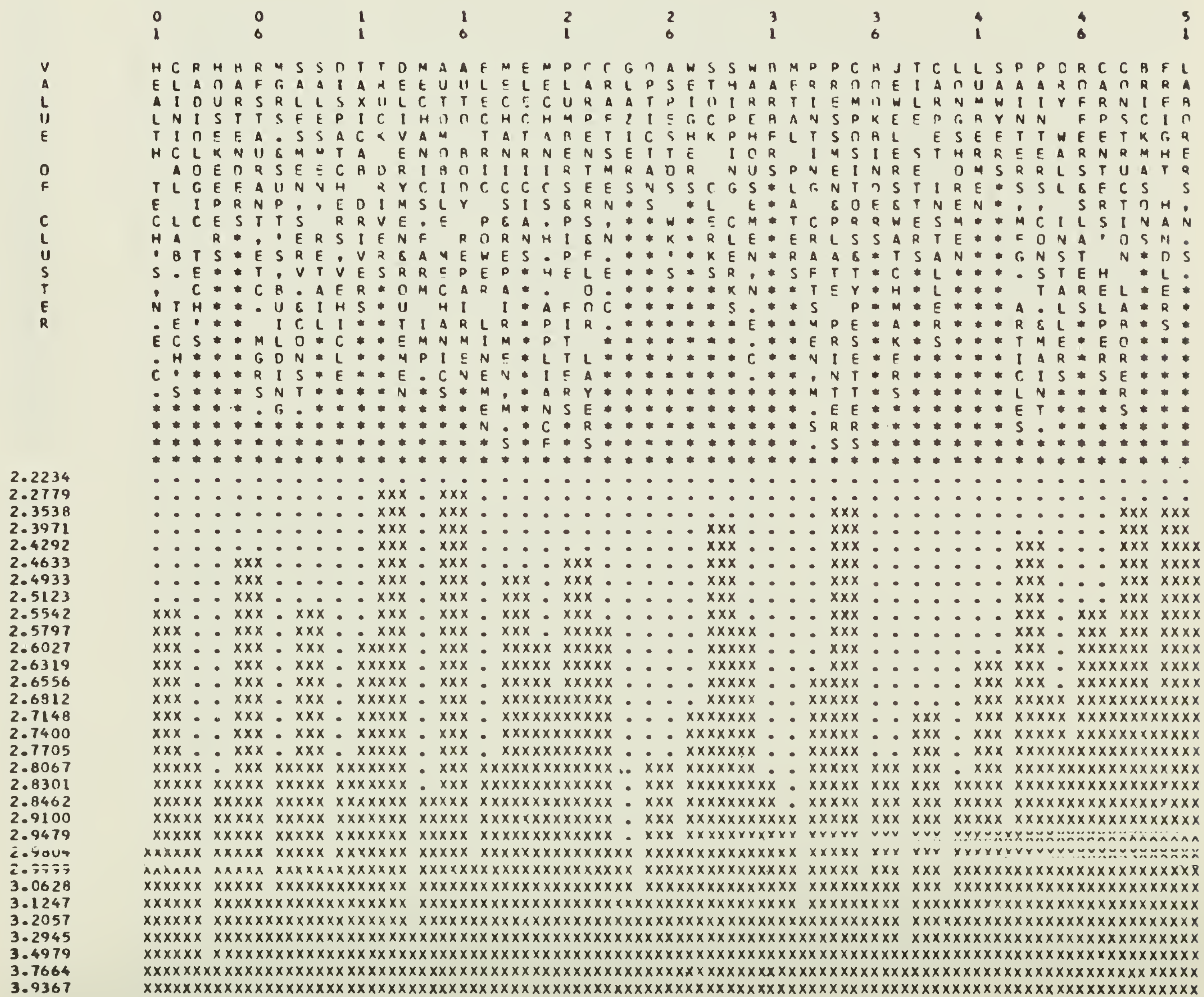

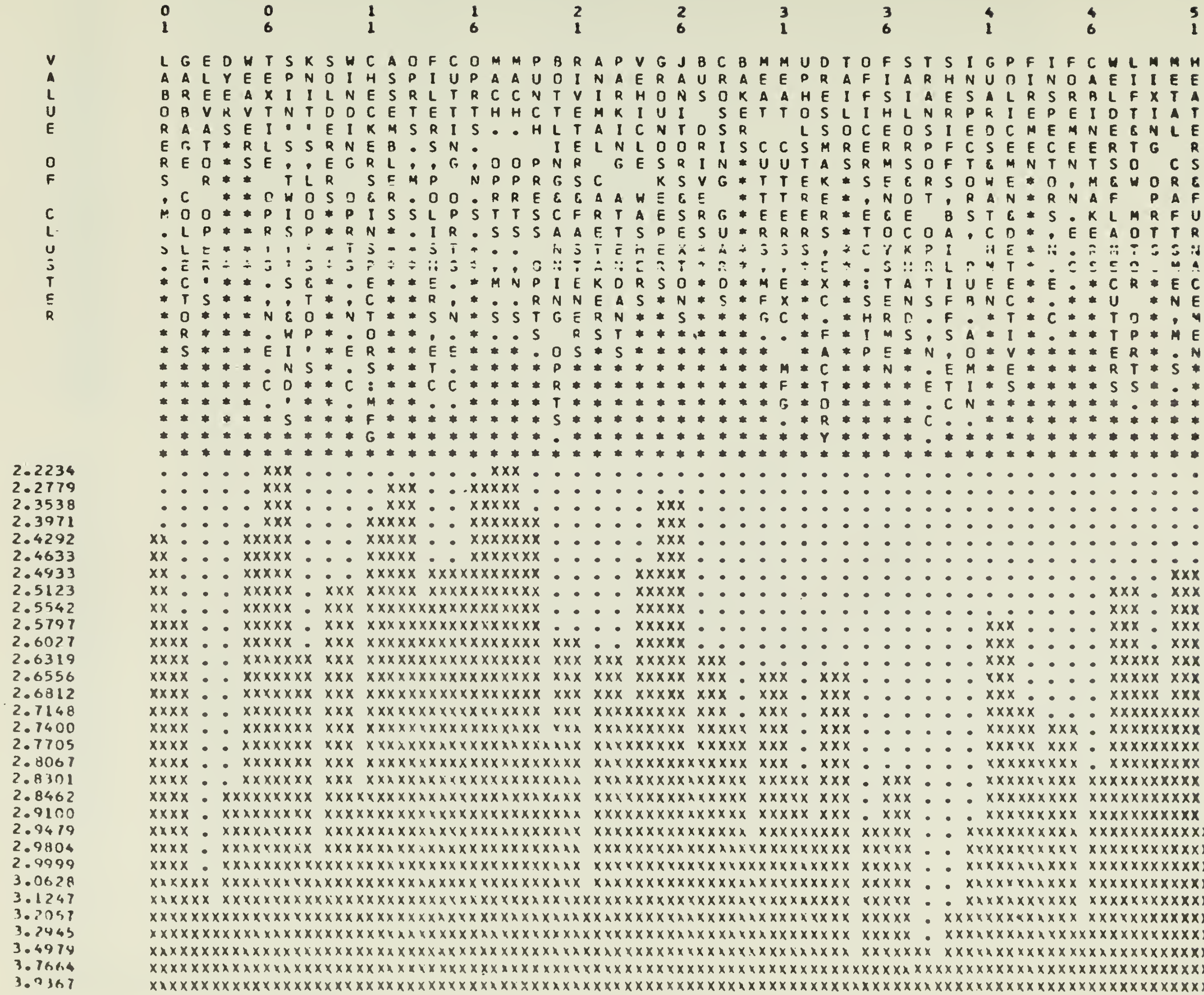
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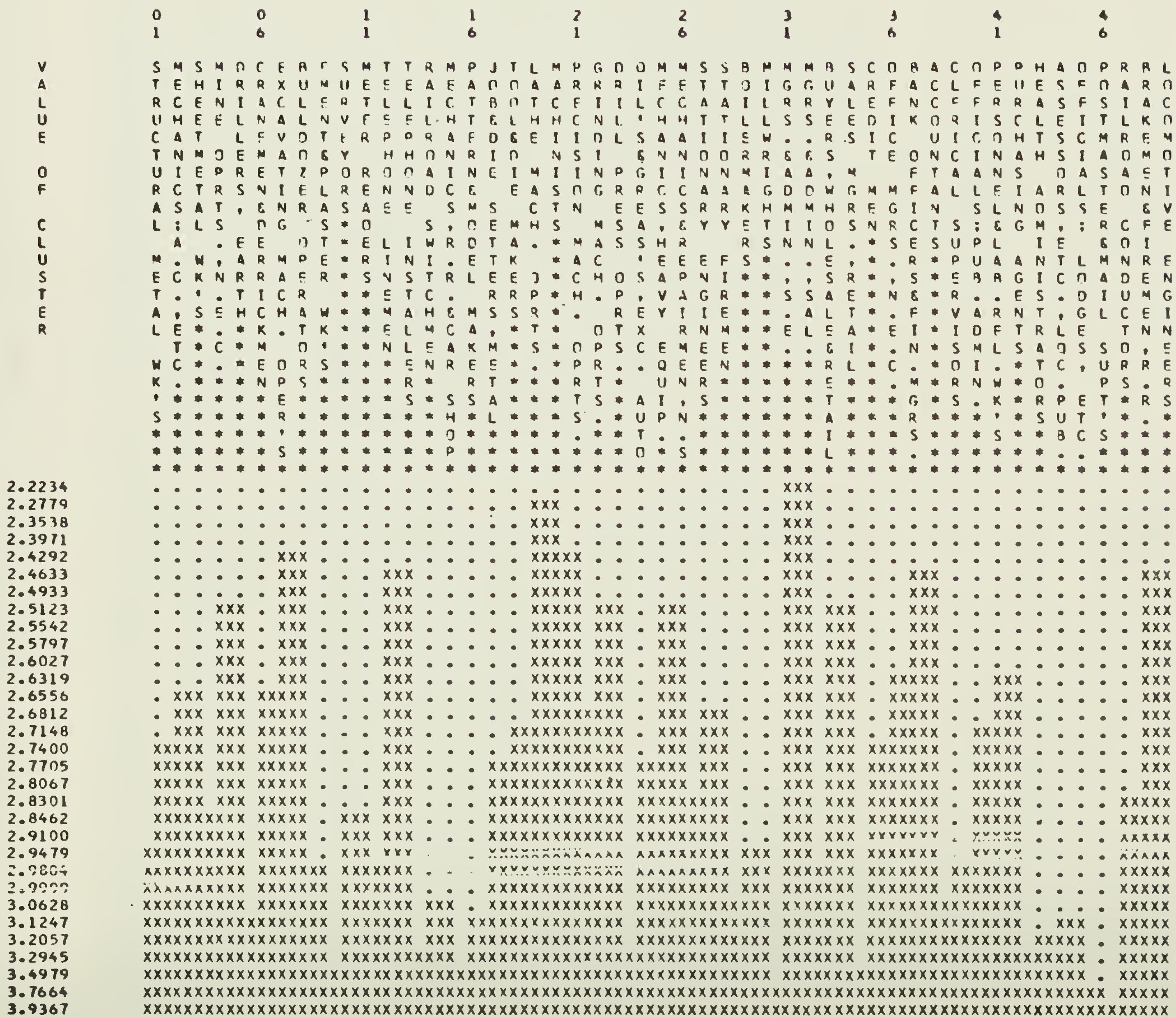
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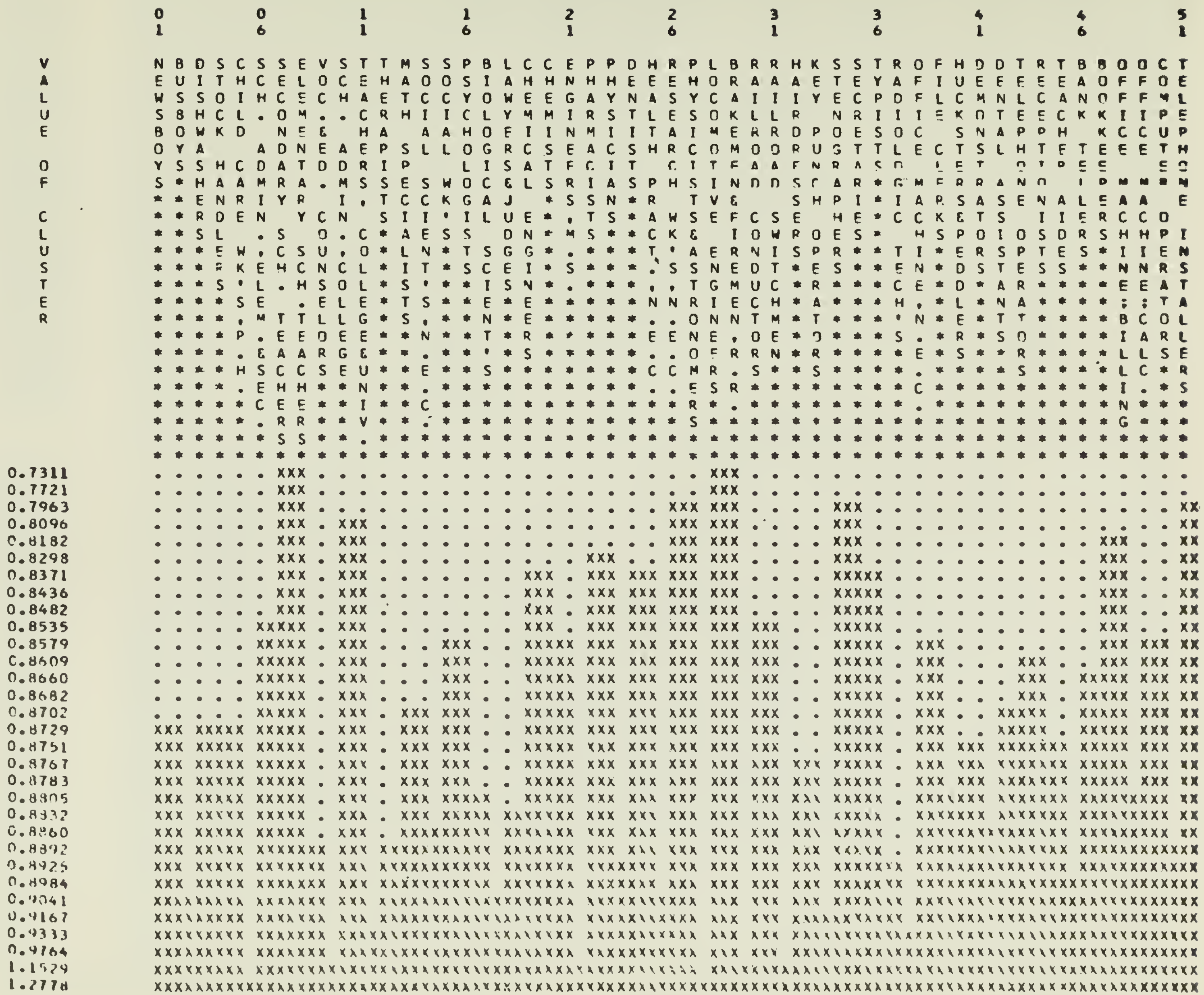
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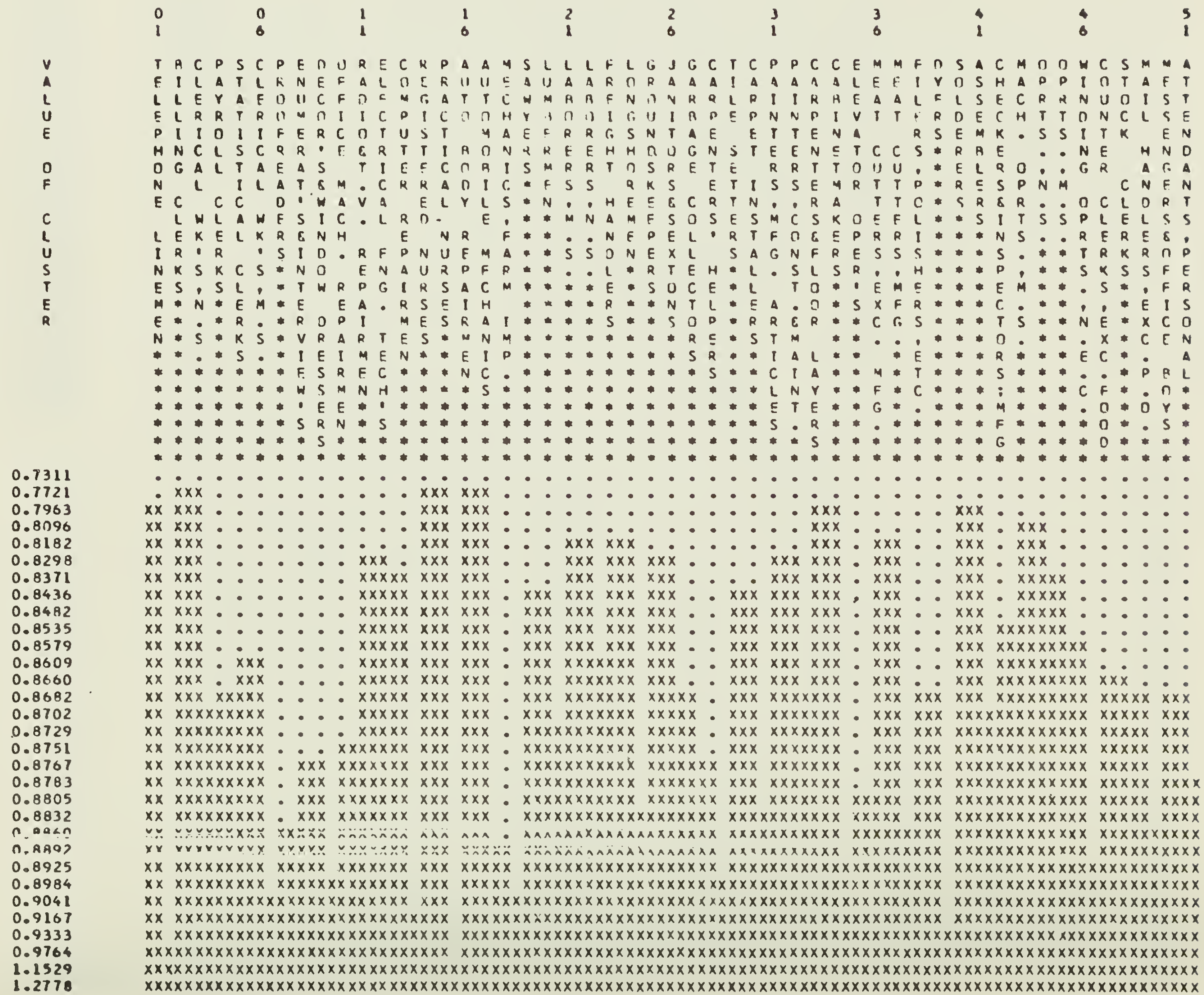
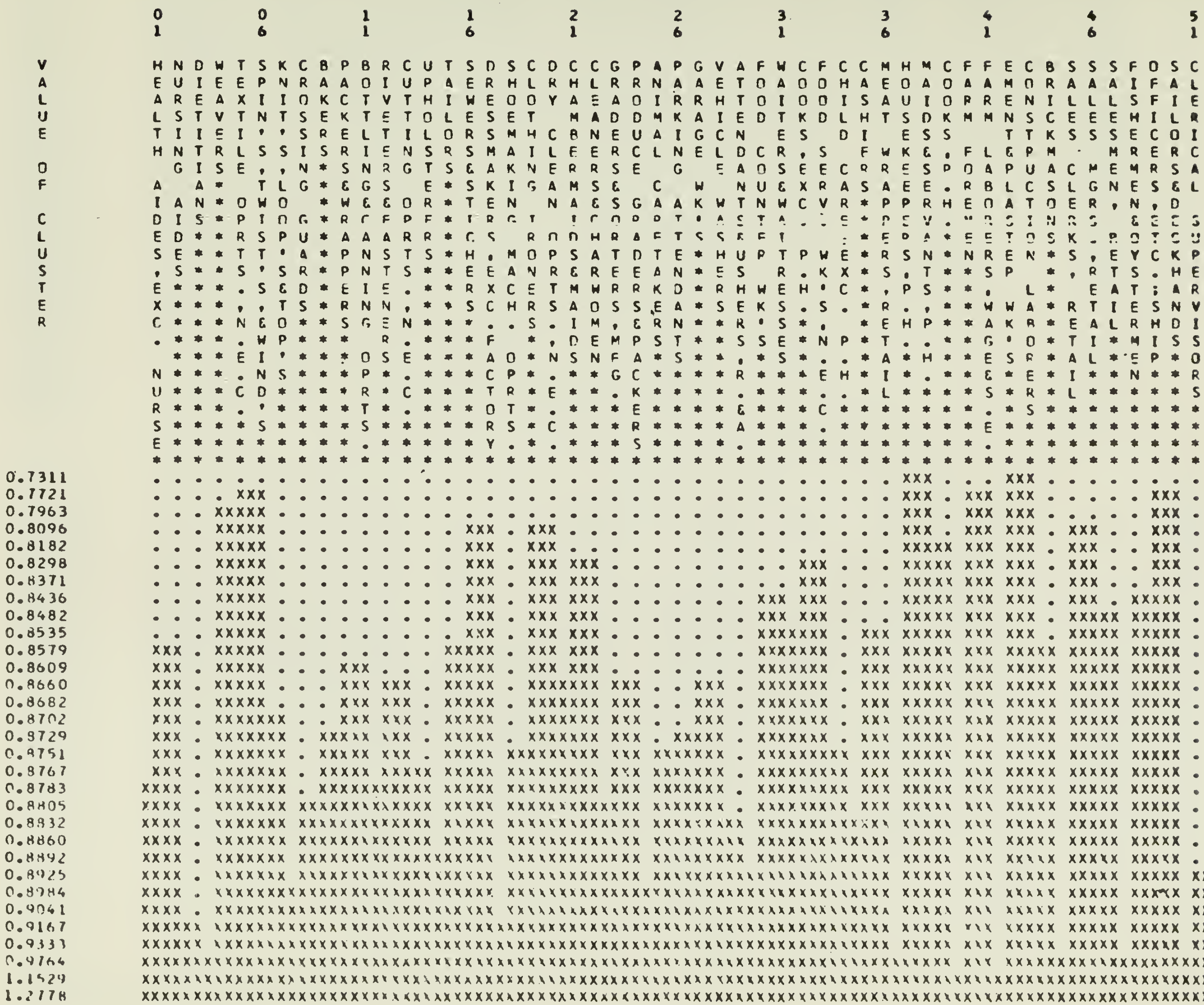
Appendix D (continued)

C. C. VII.2

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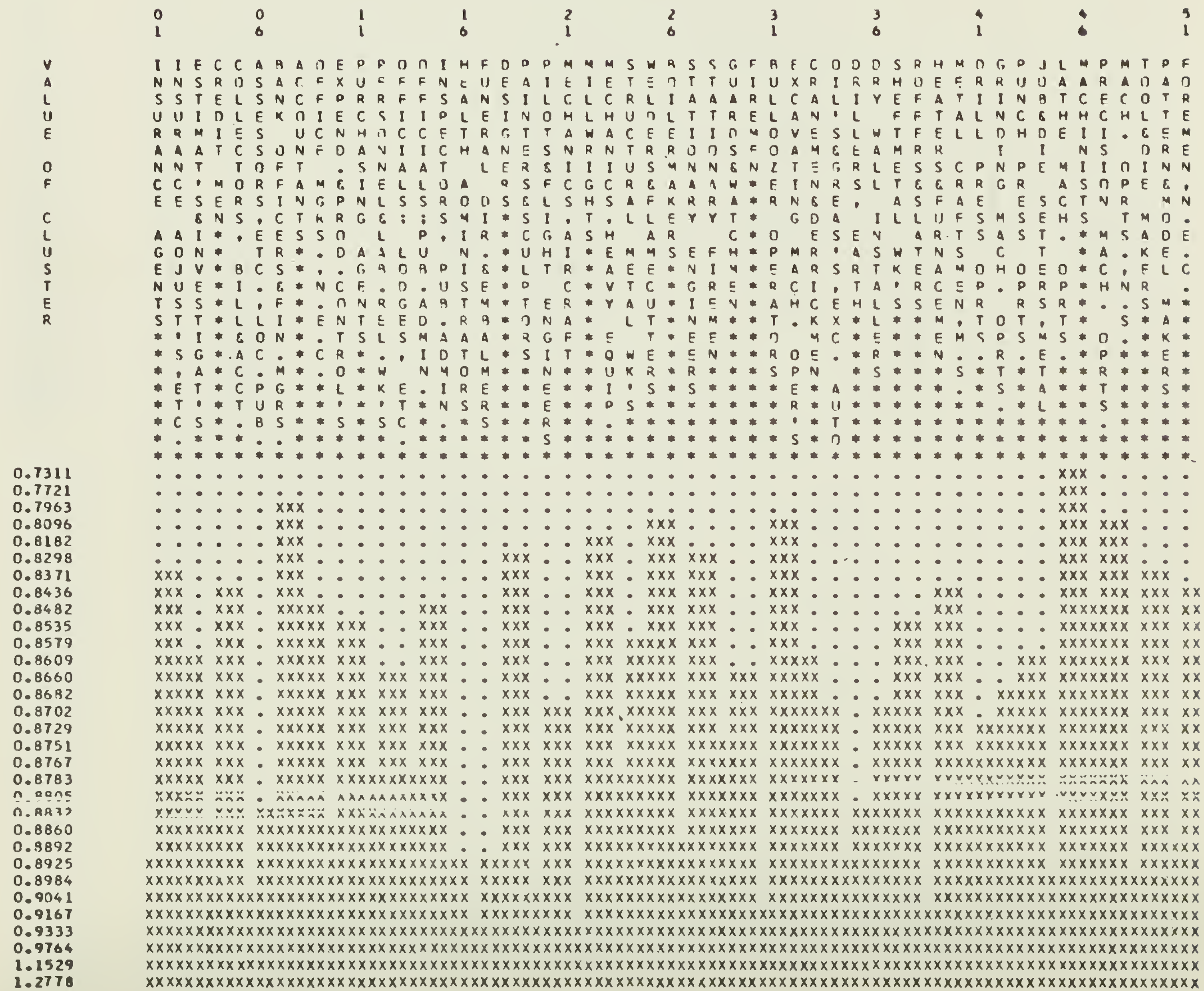
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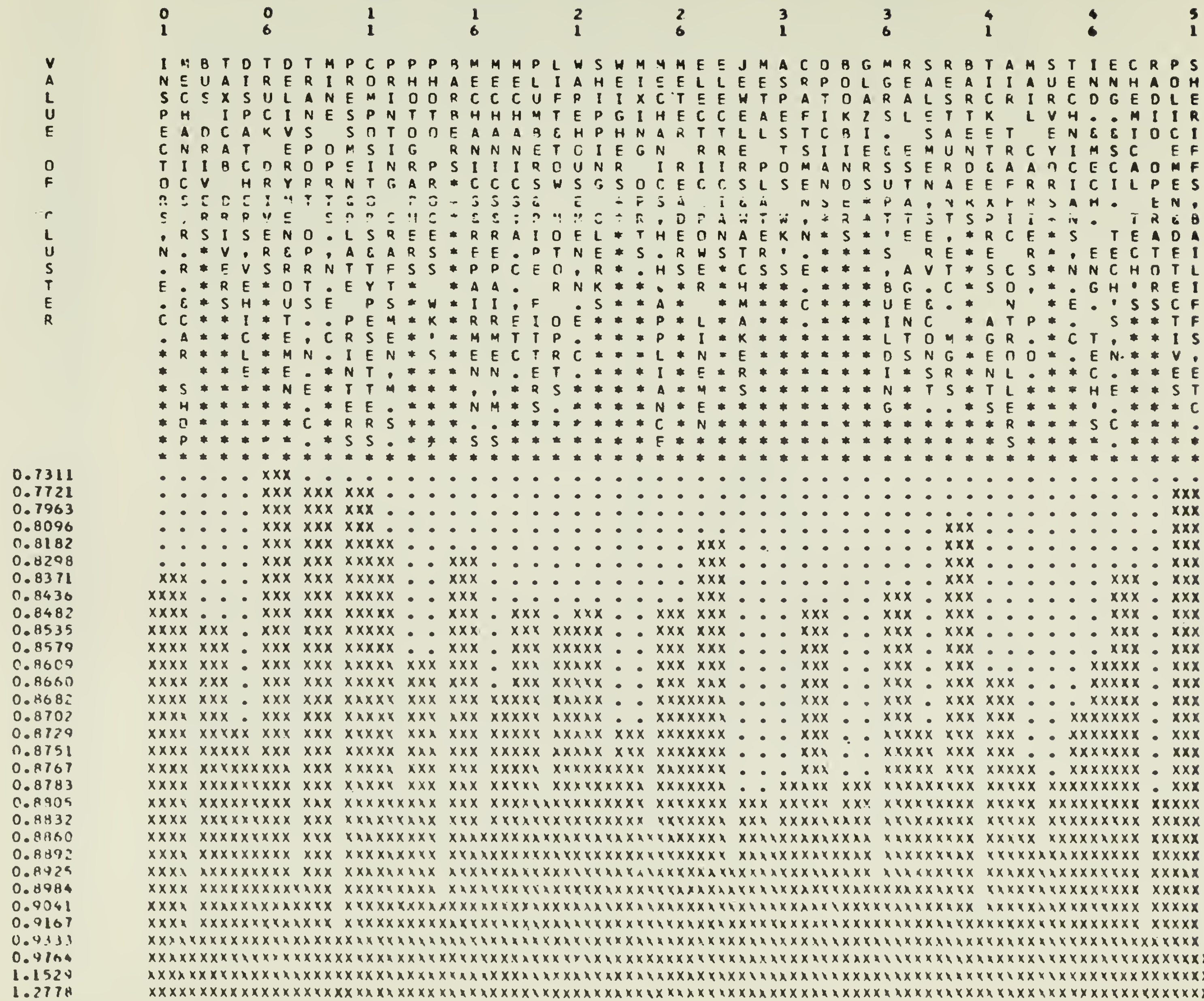

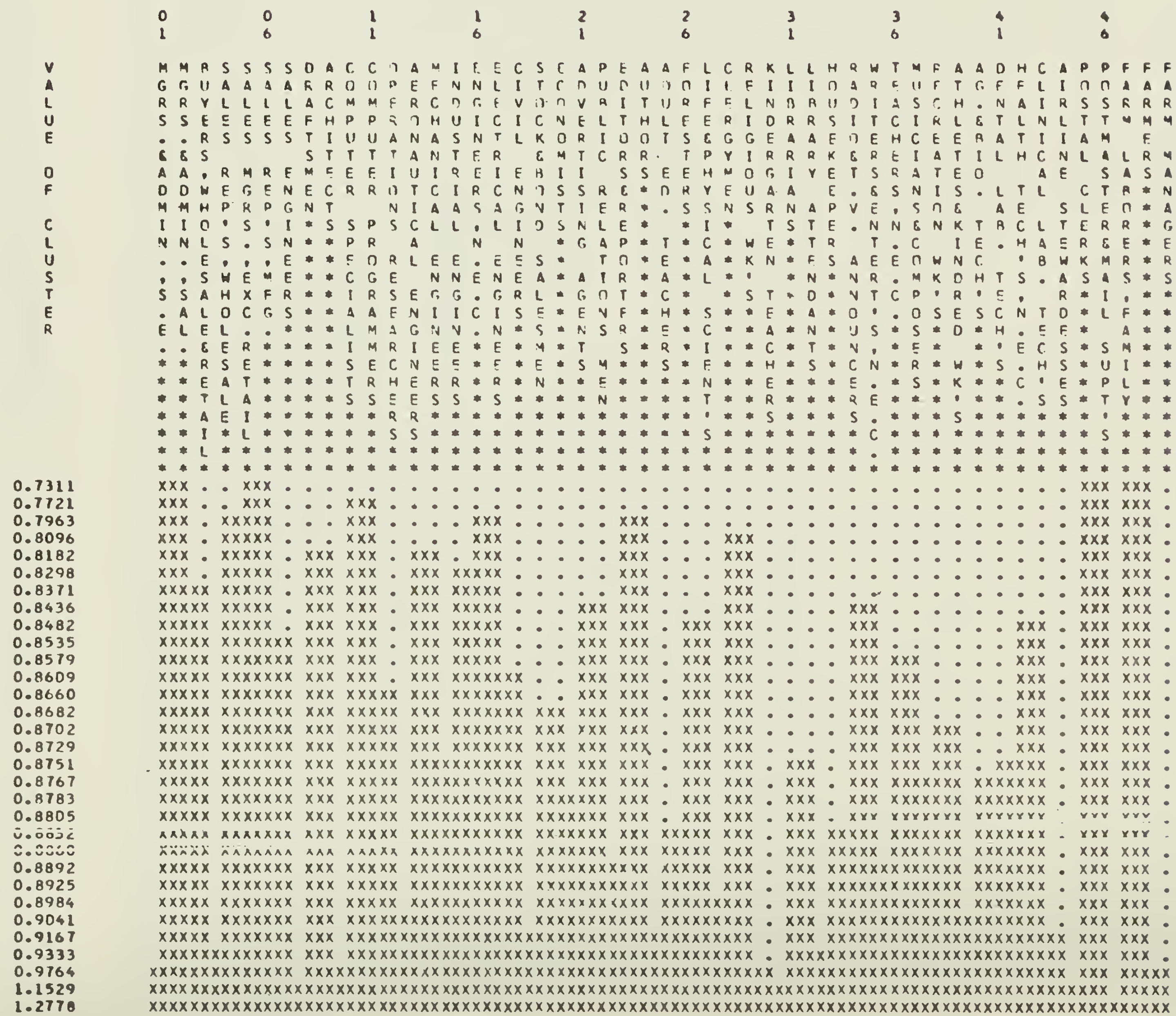

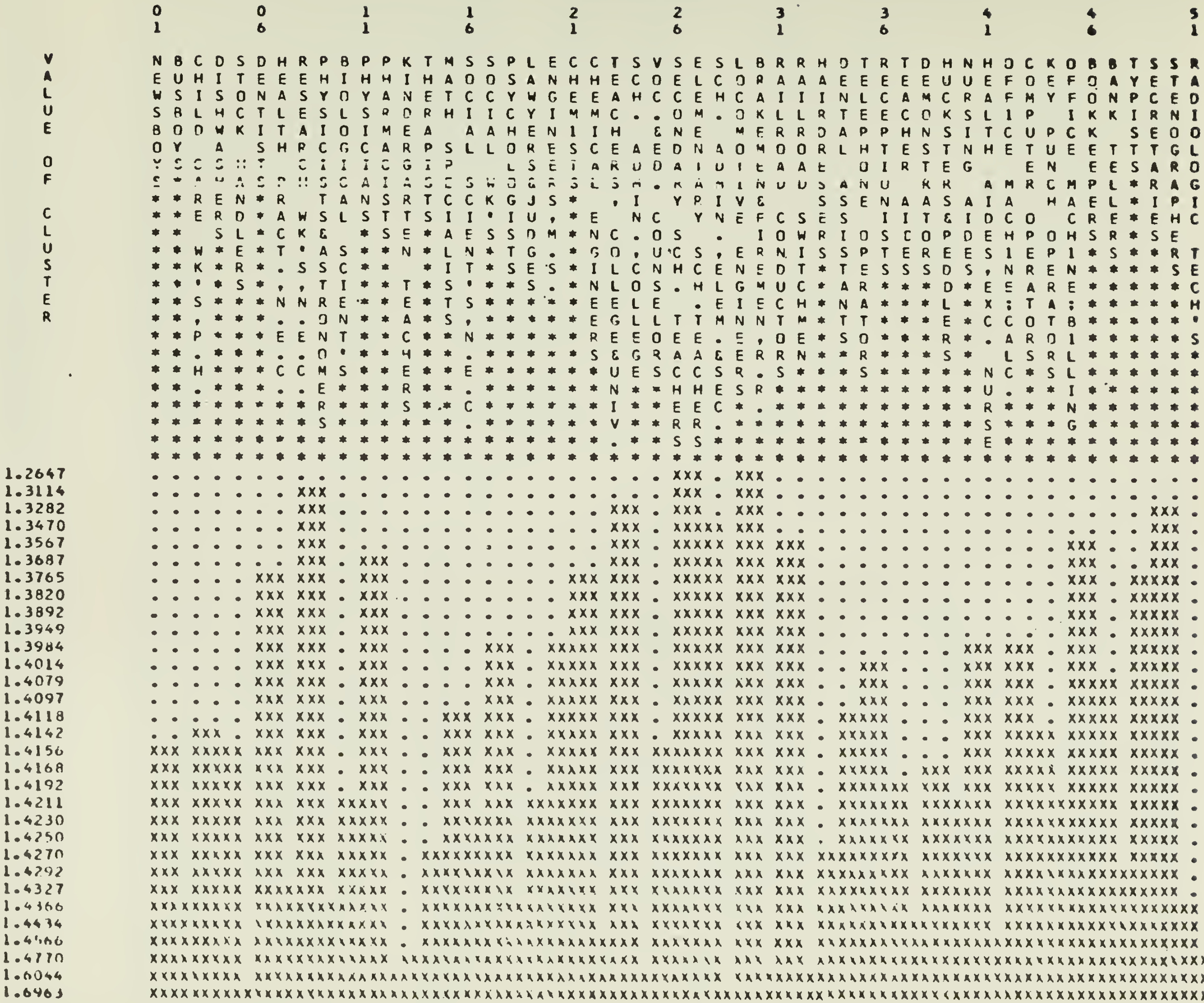
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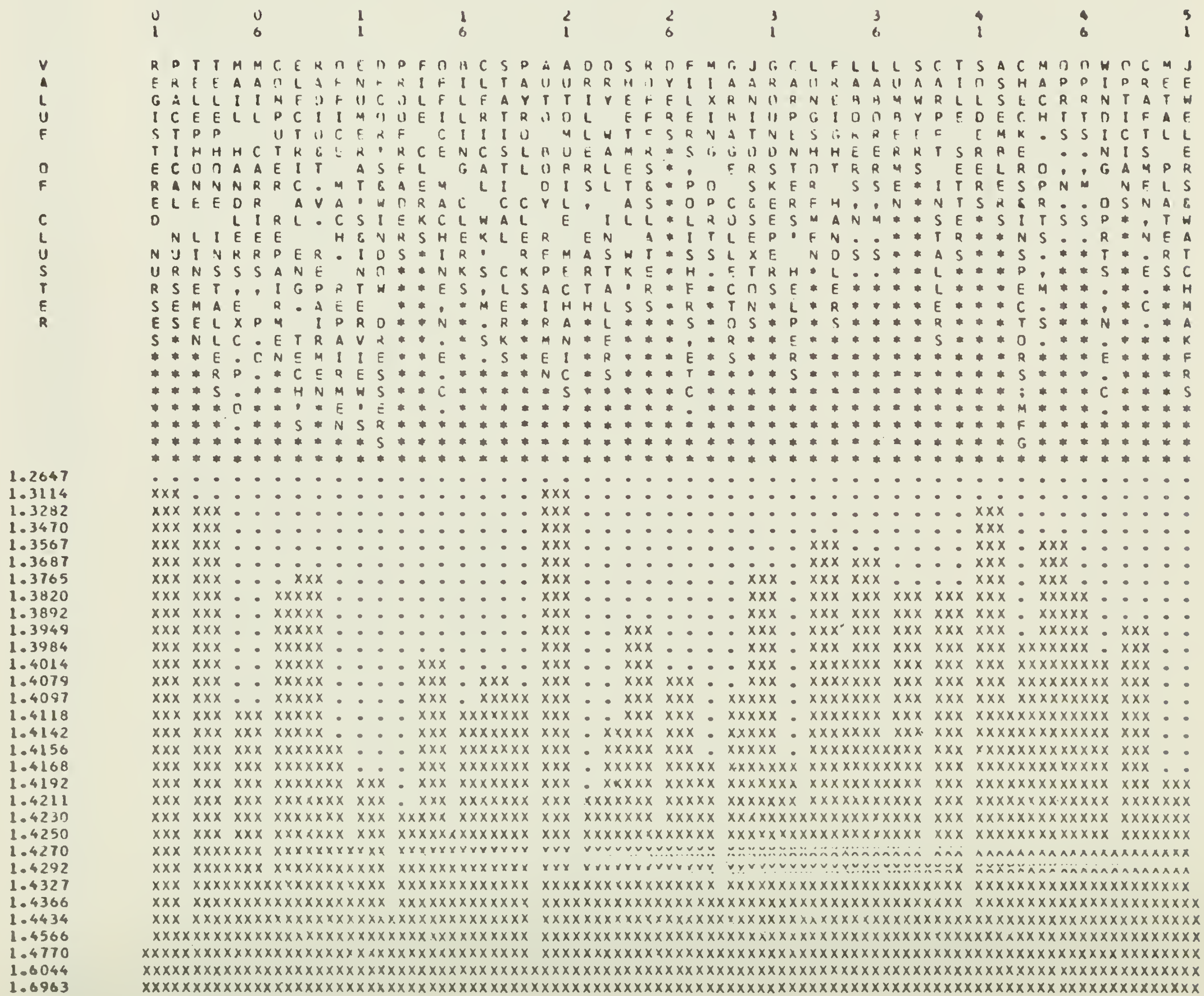

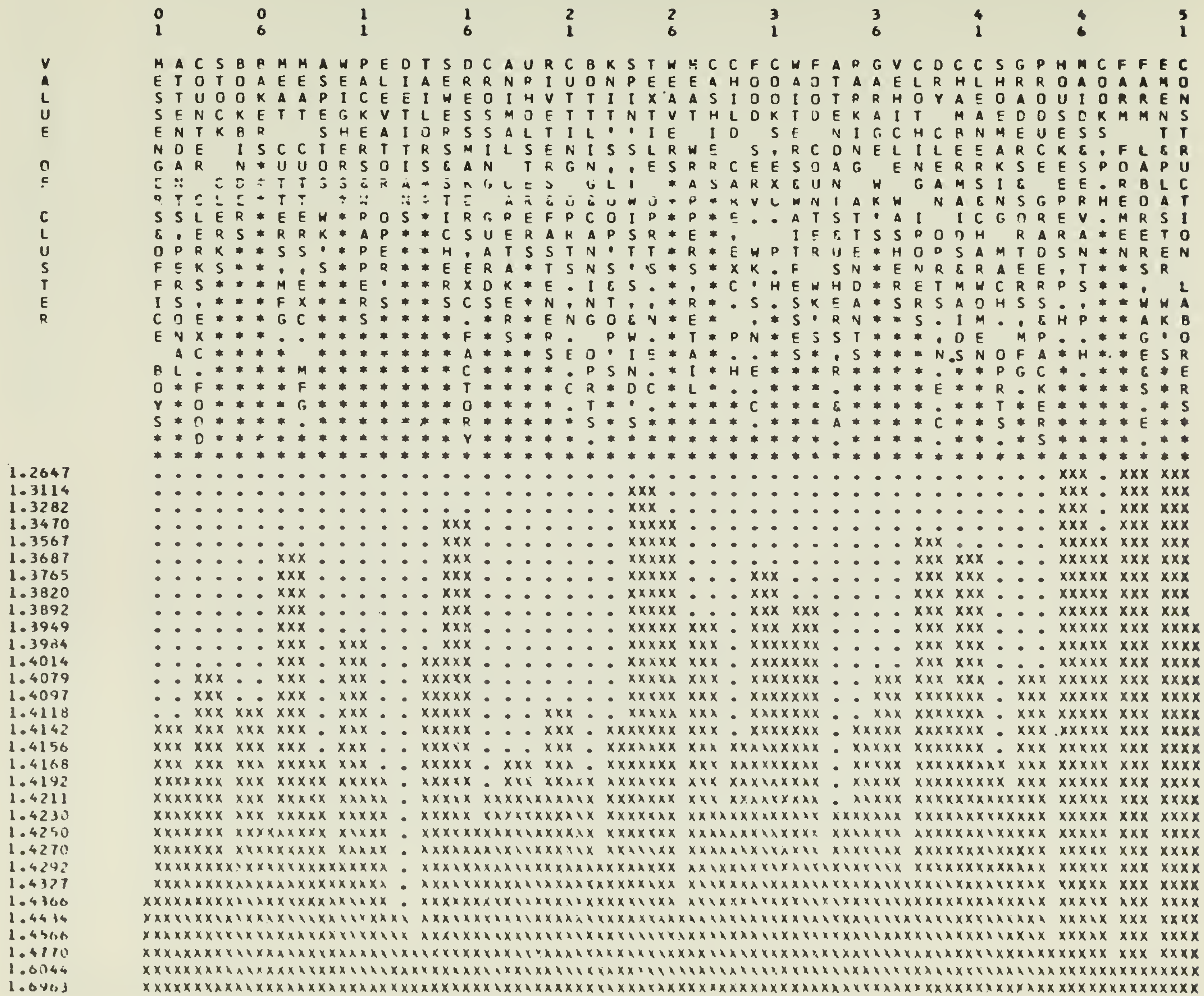

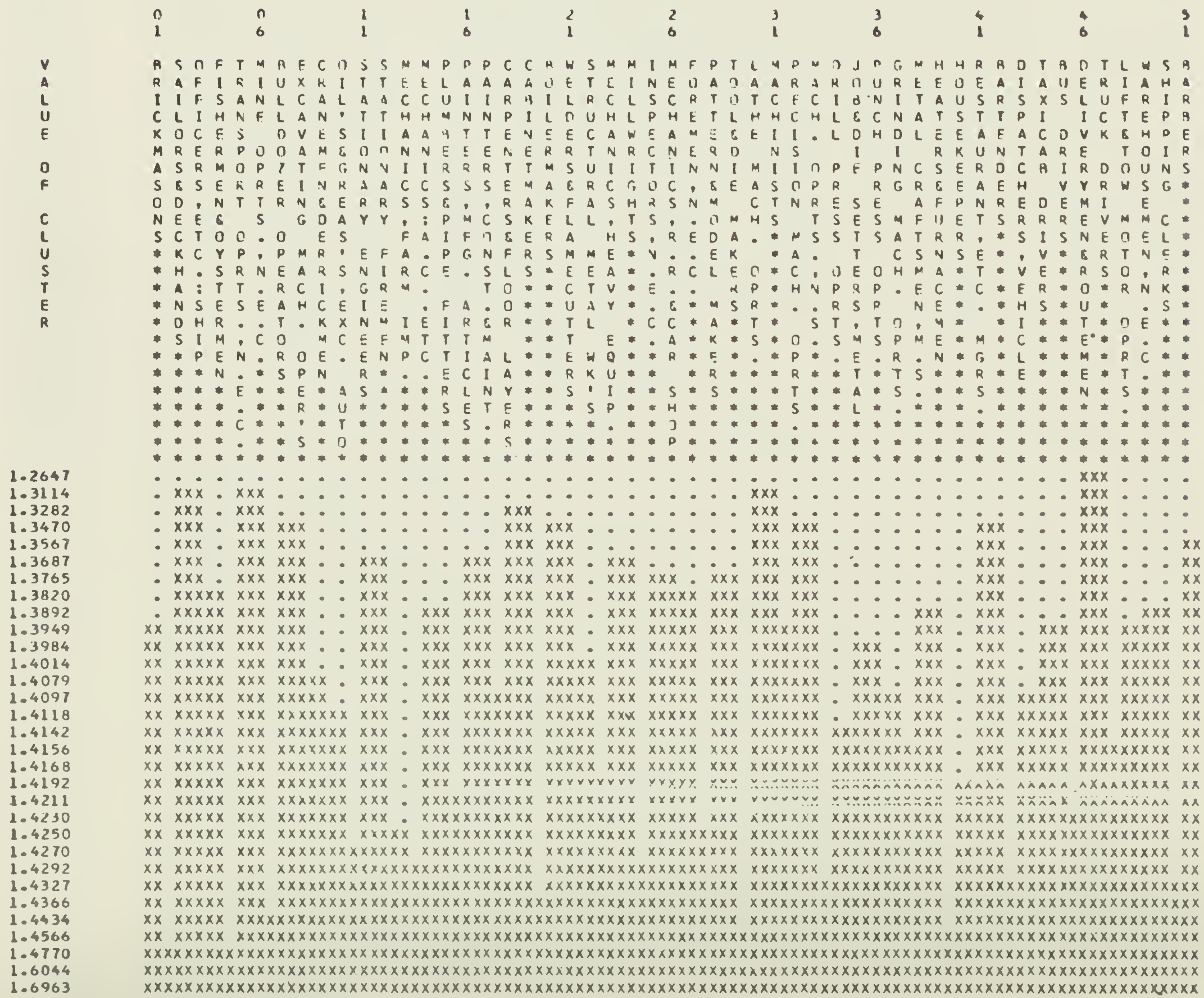
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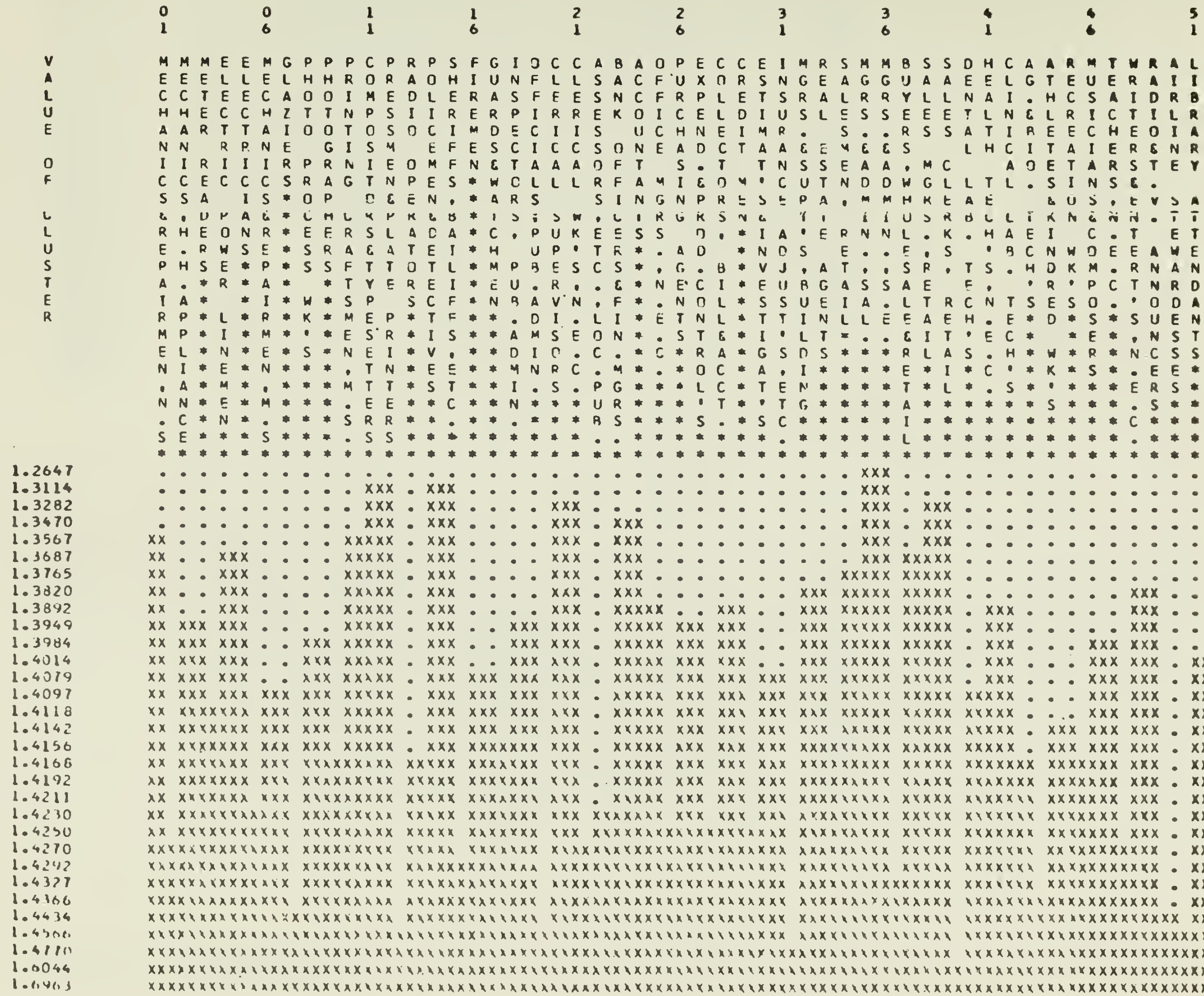
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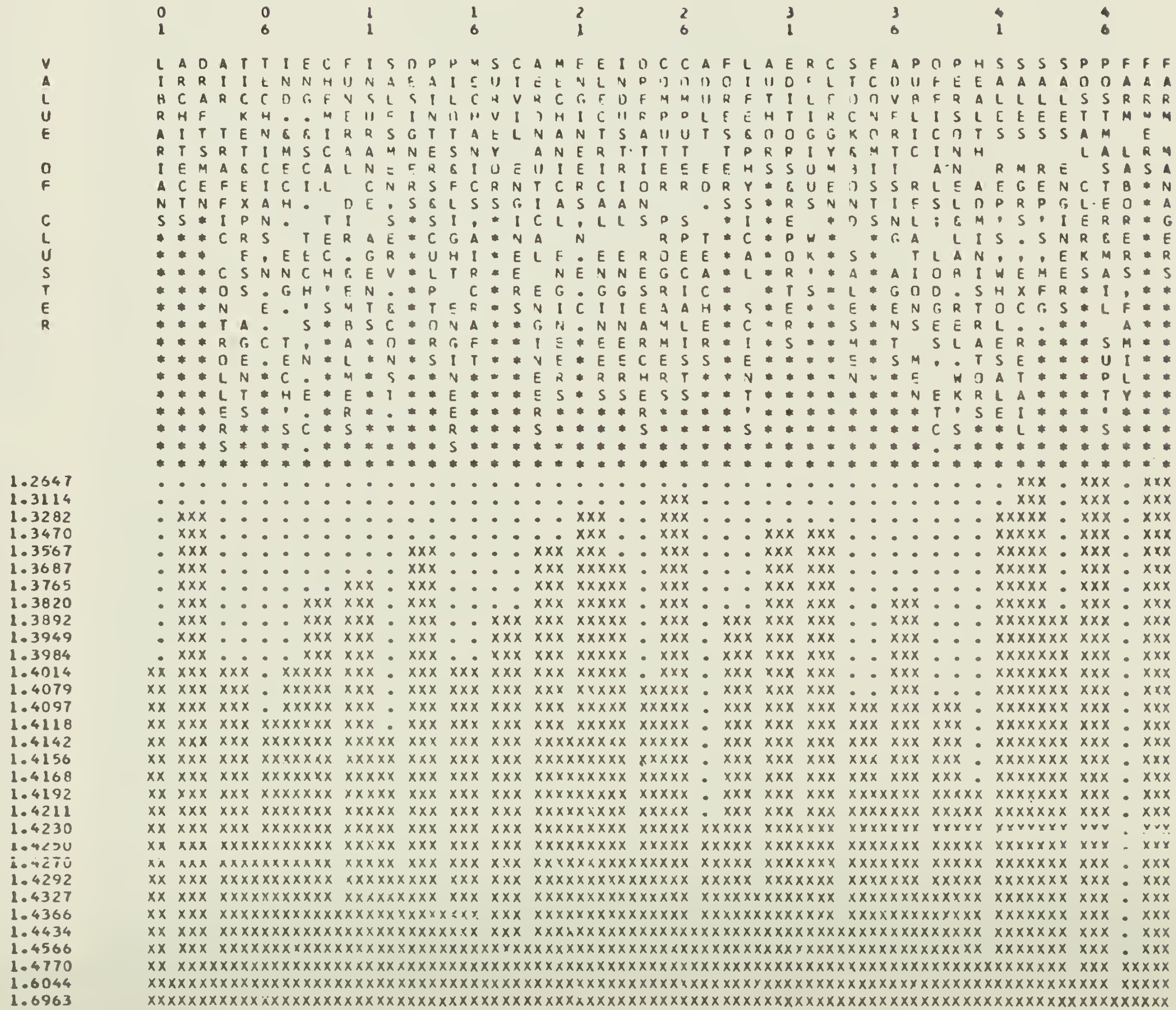

VITA

Robert C. DauffenBach, Jr. was born in Albuquerque, New Mexico in May of 1946. He received his public schooling in Wichita, Kansas. He earned the degrees of Bachelor of Arts and Master of Arts in Economics in 1968 and 1969, respectively, from Wichita State University. He graduated with distinction and has since been elected to the scholastic honor society, Phi Kappa Phi. Since September, 1969, Mr. DauffenBach has been a graduate student in Economics at the University of Illinois. He majored in Labor Economics, Public Finance, and Mathematics. He has served as a teaching assistant at the University of Illinois.

His principal areas of research are, at present, related to structural segmentation of the labor market and the implications for occupational supply and demand, inflation, labor force participation, and earnings and unemployment differentials. He plans to continue his research on occupational supply including the development of simulation models. He is also interested in the development of occupational classification schemes of greater economic content which could be beneficial to other labor market research and job vacancy measurement.

Mr. DauffenBach is now an assistant professor of Economics at Wayne State University.

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4. Title and Subtitle THE STRUCTURE OF OCCUPATIONAL MOBILITY IN THE U. S. ECONOMY			5. Report Date December 1973
			6.
7. Author(s) Robert C. DauffenBach, Jr.			8. Performing Organization Rept. No. CAC No. 103
9. Performing Organization Name and Address Center for Advanced Computation University of Illinois at Urbana-Champaign Urbana, Illinois 61801			10. Project/Task/Work Unit No.
			11. Contract/Grant No. 91-17-73-06
12. Sponsoring Organization Name and Address U. S. Department of Labor Manpower Administration Washington, D. C. 20210			13. Type of Report & Period Covered Research - Final Report
			14.

15. Supplementary Notes

None

16. Abstracts Knowledge of the extent and character of occupational mobility is basic to efficient and effective manpower planning and forecasting. This study is a highly detailed approach to such extent and character research questions. The fundamental purpose of this investigation is the identification of mobility-related groups of occupations through use of a neutral methodology. A cluster configuration of occupations, based on mobility patterns and linkages, enables a test of the worth of the recently proposed "Job Family" basis of occupational classification. Also, it provides information on the nature and kind of families of jobs--thus, there is a typological dimension to this study.

A theoretical approach to labor market dynamics through occupational mobility is provided in Occupation System Theory--a synthesis of Vocational Development and Labor Market Structure theories in conjunction with the Job Cluster concept. Two mobility models are employed: (a) the probability transition matrix (P) and, (over)

17. Key Words and Document Analysis. 17a. Descriptors

Occupational Mobility
Manpower Planning and Forecasting
"Job Family" Occupational Classification
Census Occupational Statistics
Cluster Analysis

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement No restriction on distribution. Available from National Technical Information Service, Springfield, Virginia 22151	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 327
	20. Security Class (This Page UNCLASSIFIED	22. Price

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16. Abstract (continued) --

(b) the recruitment dependence matrix (R). A separate report, CAC Document No. 104 (NTIS Report No. UIUC-CAC-DN-73-104), is a Supplementary Appendix containing Occupational Code Transformations, Probability Transition (P) Matrix, and Recruitment Dependence (R) Matrix.

Several important conclusions evolve from this study: aside from identification of interesting supply interrelationships between the diverse job categories and amplification of the dynamics of labor market operation, the fundamental conclusion is that the job family model is the relevant basis of occupational classification.